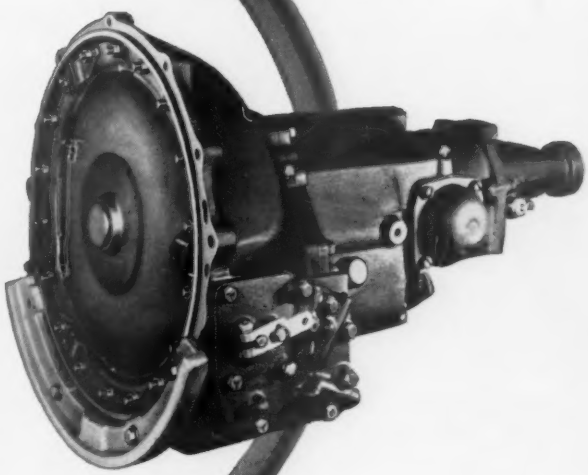
News about

B.F.Goodrich Chemical *raw materials*

For transmission seals and gaskets...

HYCAR 4021 RUBBER

resists sulfur-bearing, extreme-pressure lubricants at high temperatures



MANY of the oils used in automobile and truck automatic transmissions are designed for high pressure service and contain sulfur-bearing additives to protect the oil. Unlike conventional oil-resistant rubbers, Hycar 4021 is *not hardened* by sulfur-bearing oils. Vulcanized parts of this material maintain flexibility throughout their life in this service.

Hycar 4021, a polyacrylic rubber, is ideal for transmission seals and gaskets, as well as other automotive applications including hose, O-rings, and similar parts. This material has a useful temperature range 50 to 100 degrees higher than the best nitrile type rubber. It withstands most lubricating oils at 350°F for extended periods, and temperatures up to 400°F for short periods.

In addition, vulcanizates of Hycar 4021 are virtually unaffected by oxygen, ozone, or sunlight, will not crack or check, and have tensile strength and elongation suitable for most applications. Finished parts have excellent flex life, resistance to cut growth, and compression set.

Hycar 4021 is one of many types of special purpose rubbers furnished in raw material form and available now. For further information write Dept. HO-12, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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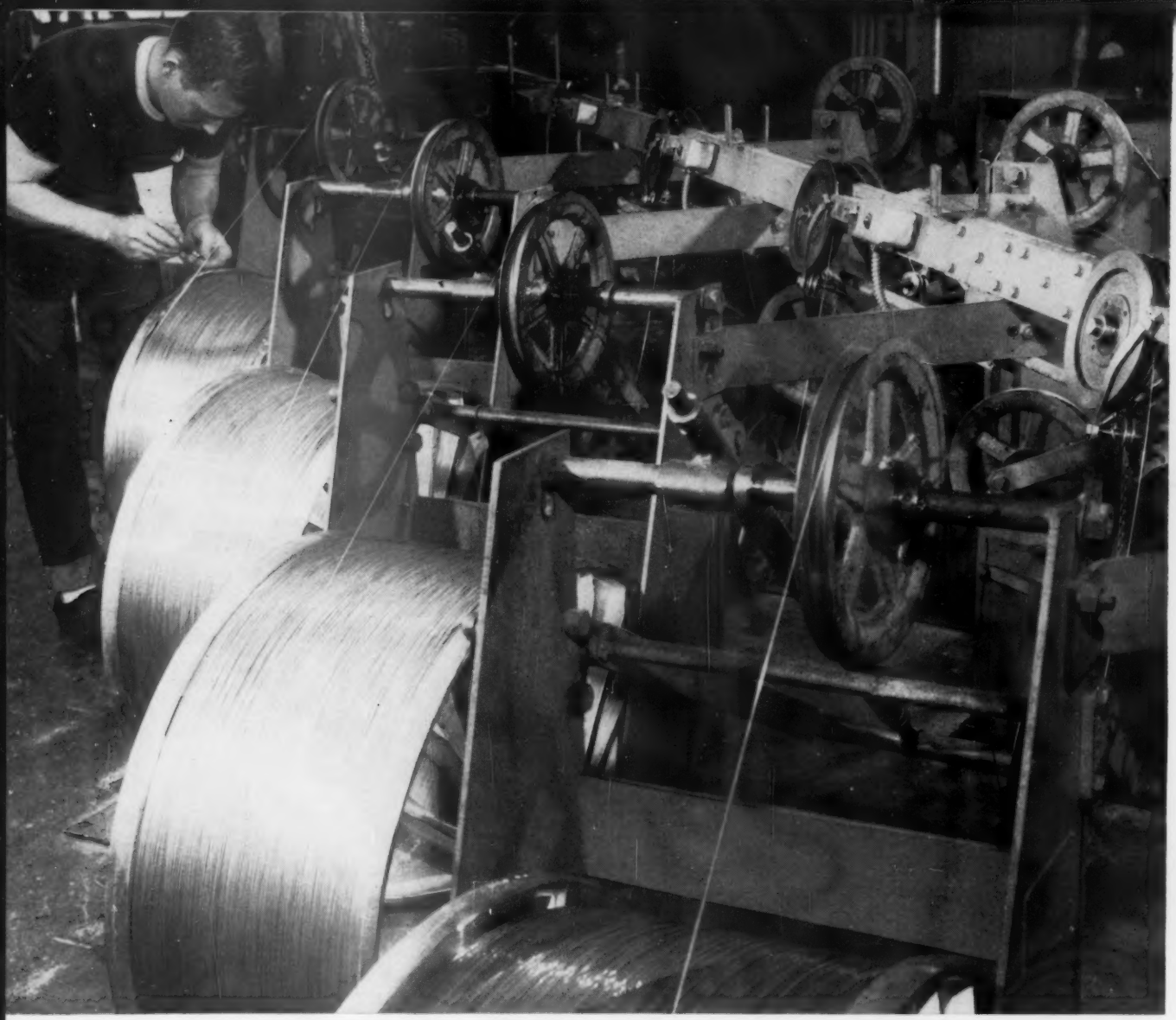


Let-off equipment at Gates Rubber is where Johnson Steel & Wire Company's tire bead wire proves out. Johnson's 1,000-pound coils give far longer runs than the former coils of 400 to 600 pounds. And Johnson's uniform quality and packaging techniques insure trouble-free operation.

Gates Cuts Tare Weights by 7½ Times With Johnson's New Bead Wire Spool

A unique history of success—founded on an unusual business philosophy—has been written during 47 years of business by The Gates Rubber Company of Denver.

From its beginning as a small leather shop in 1911, employing a single person, until the present when it is exceeded in size by only five other rubber manufacturers among 1,400 in the industry, Gates has restricted its production to what it calls "necessary accessories to an essential product."

Following this policy, Gates today is a leading supplier of industrial rubber products, one of the largest producers of hose, the world's largest manufacturer of V-Belts, as well as a growing producer of tread rubber and top quality truck and passenger car tires.

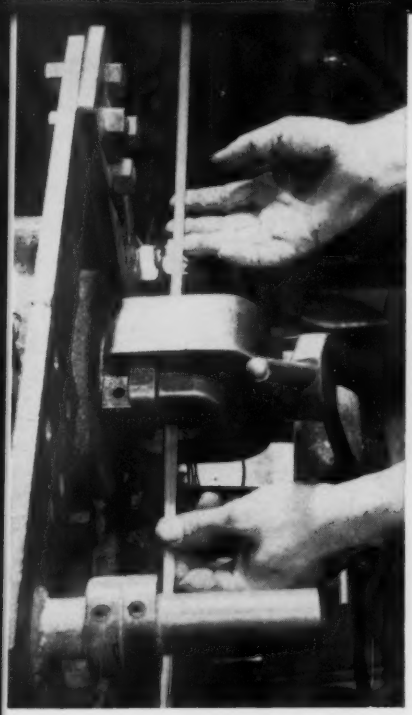
In tire manufacturing, as in its production of other products, Gates follows this three-fold quality "code."

1. Get the latest, most efficient tire-making equipment and operate it in a clean, modern plant.
2. Insist on finest raw materials.
3. Establish rigid specifications—test to make sure specs are met—inspect products in process frequently to be certain of desired final quality.

It's on points 2 and 3 that Johnson Steel & Wire Company, Inc., comes into the Gates picture.

Johnson's tire bead wire meets all requirements of Gates' four major specifications: uniformity of tensile, gage, plating as well as cast.

Then—in meeting Gates' fifth specification (for packaging), Johnson goes a step further and ships its tire bead wire on the finest new spool-less core available in the bead wire industry.



Here the actual beads are formed. Thick, uniform bronze coatings on tire bead wire, plus required composition, result in perfectly formed, evenly spaced beads that are tightly adhesive.

Where tires get muscles. Tire beads, each made of miles of Johnson Steel's tire bead wire, are shown here ready for delivery to the tire builder.

On Bag-o-matic machines like these, tires are shaped and cured. The Gates' battery of Bag-o-matics is one of the industry's largest and most modern.

In transit, the protection Johnson's new spool-less core gives bead wire is important, but equally so is another factor—savings in freight costs.

Gates is extra sensitive to shipping costs. By drastically reducing tare weight on reels of wire being shipped to Gates, and by fully eliminating return of empty reels, Johnson cuts tare weight to two pounds per hundredweight.

Easily palletized for quick fork-truck handling, Johnson's bead wire on spool-less cores represents 7 to 7½ times less tare weight than old-style reels. Since there's no return of the flangeless cardboard cores, this expense is out entirely.

Once in the Gates plant, spool-less cores require less storage space. There is nearly 1,000 pounds of wire per coil.

The clean, unbroken surface of Johnson's tire bead wire, the required composition of the bronze plating on the correctly tensiled wire all mean that the miles of wire in a Gates bead will do the job it's designed for: giving strength equal to the overall quality of the tire.

The same assurance of quality wire and the latest in packaging technology that Gates gets are available from Johnson Steel no matter what your specialty wire needs.

Whether it's wire for brushes, aircraft, bobby pins, high-strength springs, textile cards, reinforced rubber hoses or tires—you can depend on Johnson. Call any of the sales offices listed here.

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a subsidiary of **Pittsburgh Steel Company**

Grant Building • Pittsburgh 30, Pa.

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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

DECEMBER, 1957 VOL. 82 NO. 3

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*Appears every other month

Microfilm copies of complete volumes of RUBBER AGE are available from University Microfilms, 313 North First St., Ann Arbor, Mich.
Indexed in Industrial Arts Index and Engineering Index

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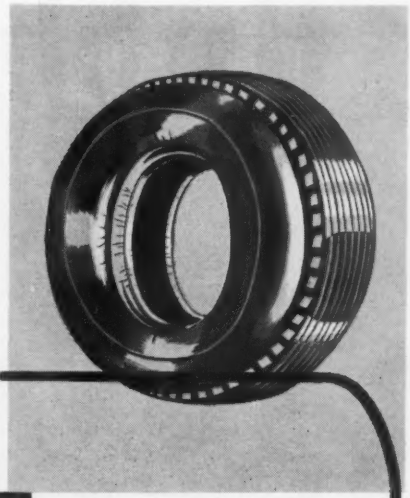

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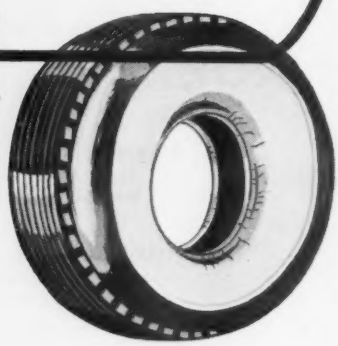

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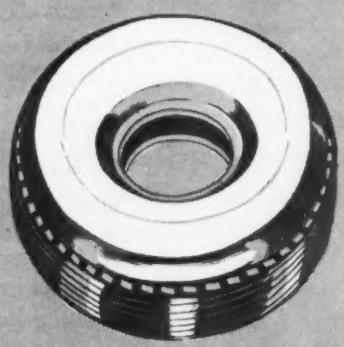

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Letters to the editor

More On Nomenclature

Dear Sir:

I have read with a great deal of interest your editorial in the October issue regarding nomenclature for synthetic rubbers. The proposed ASTM Nomenclature was discussed at one of our Crude Rubber Committee Meetings and there was no inclination at all on the part of our membership to adopt this nomenclature for purchasing purposes. This Committee assumed that there might be some benefit in it for technical purposes and it might be used in technical papers.

Your editorial certainly expresses my own personal feelings regarding this nomenclature, because since its issuance it has been impossible for me to remember what these various alphabetical assemblies mean.

You might be interested in the attached copy of a bulletin sent to our Crude Rubber Committee for the purpose of correlating the new ASTM alphabet with the commercially available synthetic rubbers. (A listing circulated to the members of the Crude Rubber Committee showing commercially available synthetic rubber with their tentative ASTM designations was forwarded with the letter—*Editor*)

In response to your request for written comment on the editorial, I wish to caution you that I am speaking personally, and not for either the Crude Rubber Committee or the Association.

I congratulate you on this very timely editorial.

W. J. SEARS

Rubber Manufacturers Association
Washington 6, D. C.

Dear Sir:

This concerns your editorial on nomenclature in the October issue of RUBBER AGE. I would like to state that I support your evaluation of this worsening situation completely. For some time I have been alarmed at this and I feel as you do that something should be done before the literature bogs down completely.

WILLIAM K. WARD

Schwitzer Corp.
Indianapolis 7, Ind.

Dear Sir:

I am in hearty accord with the thoughts expressed in your editorial of October on nomenclature. Whenever I use the codes in correspondence or in reports I invariably define them. The codes are confusing. I feel we would be better off if we adhered to the old terms which are already so well established and require no explanation.

I. DROGIN

United Carbon Co.
Charleston, West Va.

CHECK these 5 examples! YOU CAN SAVE TIME AND MONEY

. . when trimming molded rubber goods on FEMCO'S Automatic TRIMMER!

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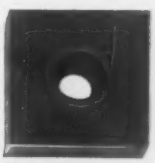

✓ 81 Cavity
TOY TIRES
4,500 Pieces
Per Hour
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Die Cost Approx. $325

✓ 14 Cavity
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13,000 Pieces
Per Hour
(Approx. Production)
Die Cost Approx. $100

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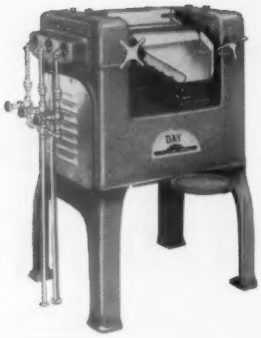
FEMCO builds special machines for cutting, trimming, splitting all the new plastics and foams, including urethanes. Write for details, tell us what you need.



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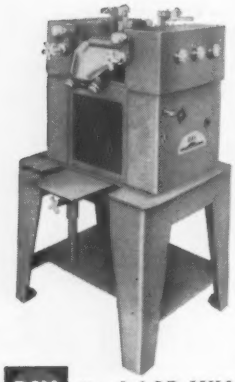

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saves time because you get the answers quickly and accurately.
Features include:
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saves time and money by virtually eliminating "downtime", because of precision engineered, rugged construction.
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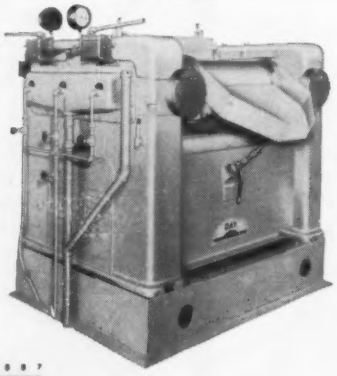
- All standard production mills are readily converted to either fixed or floating roll operation
- Day Hydra-Set available as optional equipment



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Shop Talk.....

► Readers will note from the "Letters to the Editor" column that the letters on the subject of nomenclature continue to come into this office. No issue with which we have concerned ourselves in recent months or even years has evoked such response. Interestingly enough, the vast majority of the letters support the position taken in our October editorial. This seems to bear out our belief that the nomenclature system for synthetic elastomers suggested by the American Society for Testing Materials will confuse the literature and subsequently—the rubber technologist.

Needless to state, we are still interested in hearing individual viewpoints. In future issues we will present some other views on this subject—a subject, incidentally, which we believe to be of major importance to the industry.

••••

► Before another word is written, may we take this opportunity to extend to all our friends in the industry our sincere wishes for the New Year. This has been rather a turbulent year for all of us. All evidence, however, points to another successful year for the rubber industry. Speaking of this industry of ours, we would call your attention to the editorial which appears in this issue. We think you will like what you read. At any rate, a happy New Year to all!

••••

► For those who have been inquiring, we can state that this issue contains the second part of the article devoted to radiation and rubber. It will be remembered that the first part of the article, which appeared in our September issue, concerned itself with how elastomers are affected by exposure to ionizing radiation. The second part offers comprehensive data on property changes in silicone, fluoroelastomer and isocyanate-urethane elastomers when they are exposed to gamma radiation. The response to the first article was most enthusiastic, we are pleased to report, and we believe the second part will also be of wide interest.

••••

► Articles scheduled for publication in our January issue run from the annual "Review and Preview" to an article on the thermal diffusivity of butyl rubber and its compounds. Also scheduled is an article on rubber-Marlex 50 polyethylene blends, and another on the absorption spectrum of carbon black dispersions. In future issues, we will try to present articles of both general and specific interest. As always, we are most interested in learning of our readers' wants and needs. Drop us a line—let us know the type of article you'd like to read.

THE EDITORS

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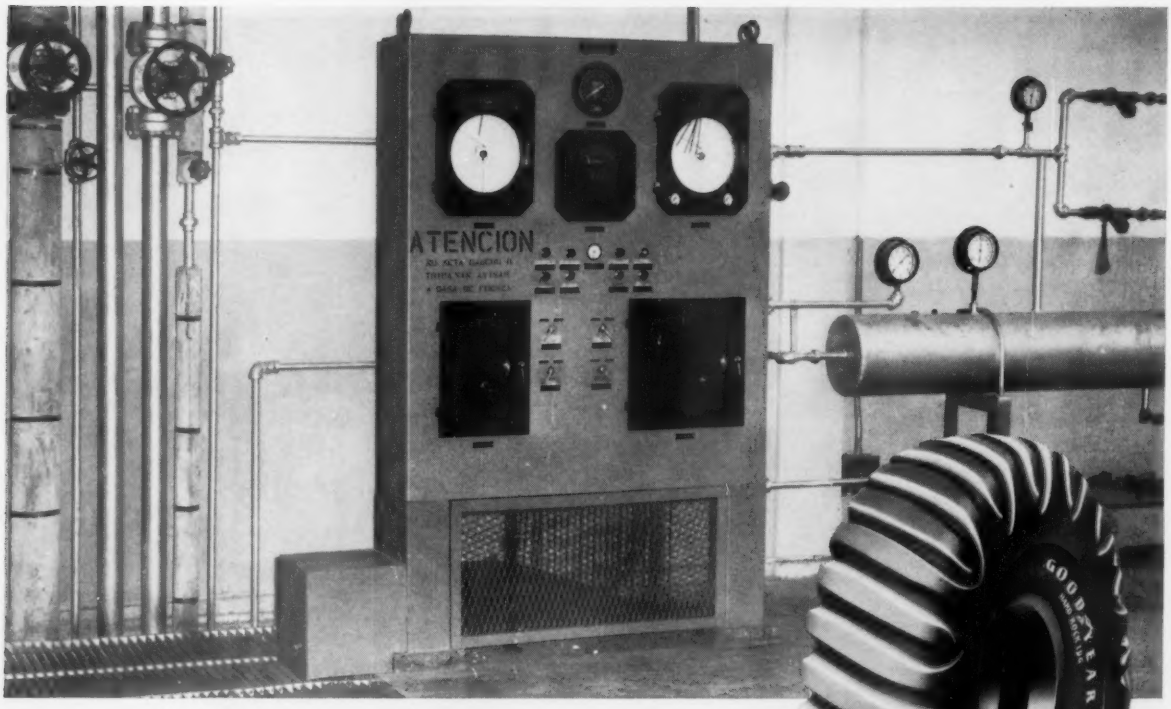

TAYLOR HELPS GOODYEAR MAKE

TOUGH TIRES

for Venezuelan trucks and tractors!

Here's the "nerve center" of the Taylor Control System for Goodyear's 120" pot heater in their new tire plant in Valencia, Venezuela. Plant officials of Goodyear Tire & Rubber S.A. report that this precision control makes possible the production of truck and tractor tires that *stay rugged over a long tire life.*

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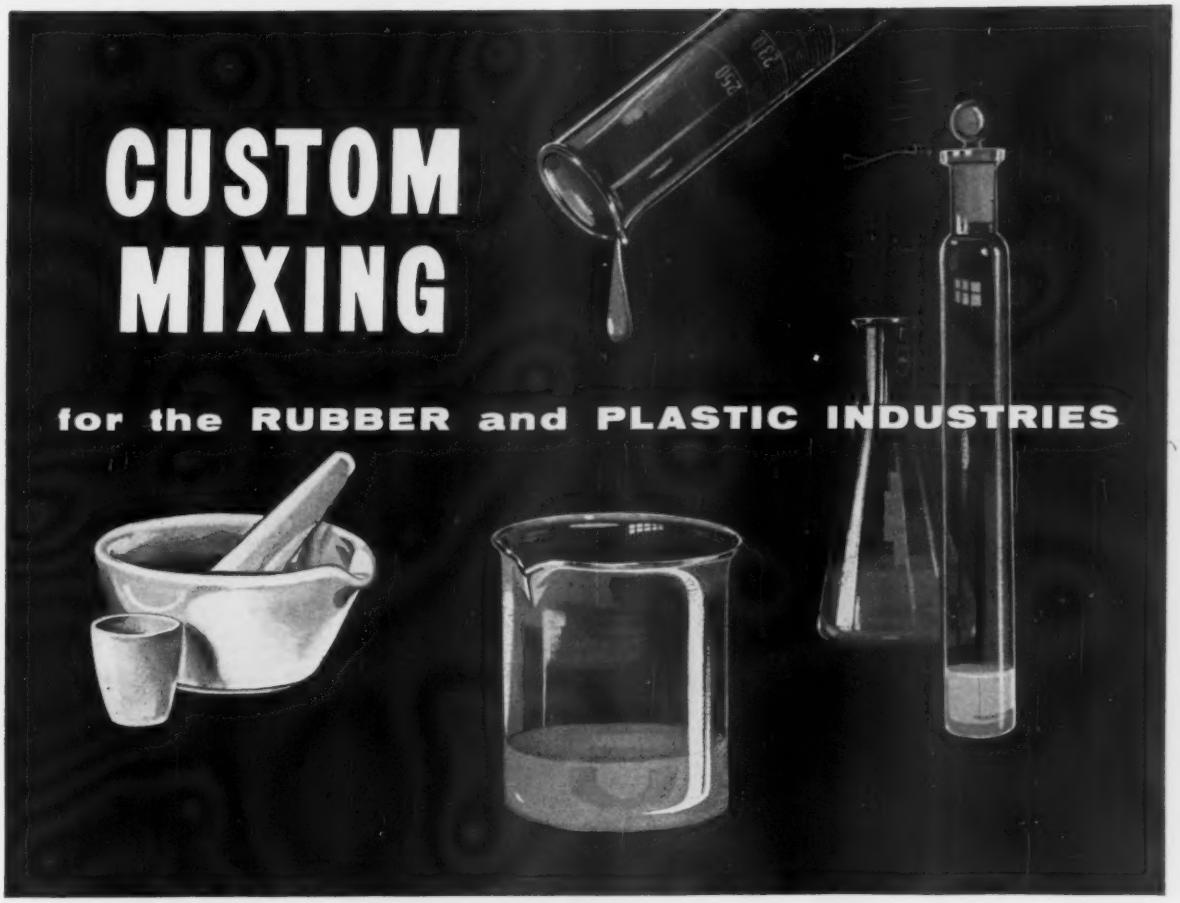

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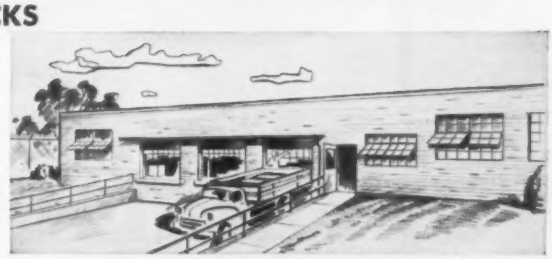

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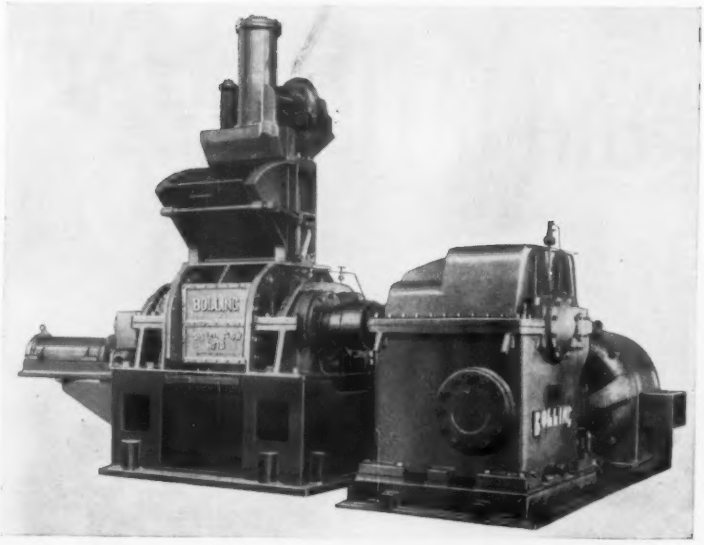
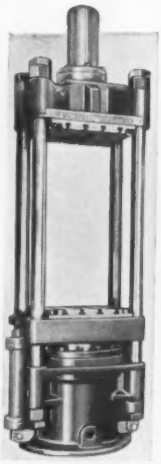
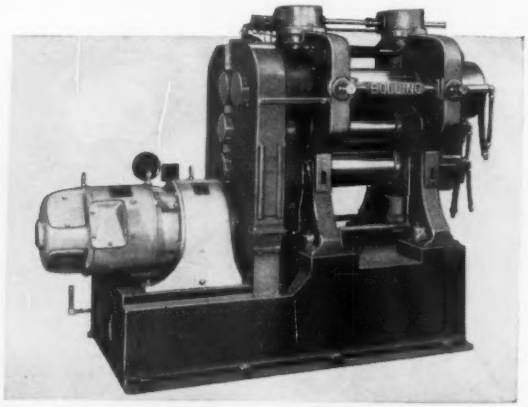


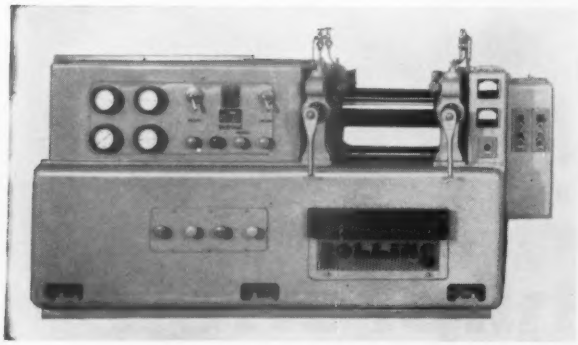
MIXERS *Above is No. 10 with compound drive. Six sizes from 231 to 16000 cu. in. chamber capacities offered.*

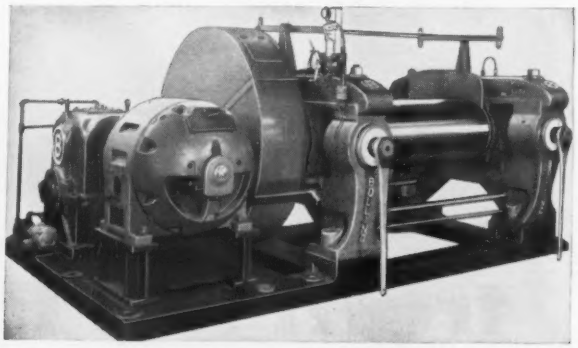


PRESSES *Transfer and compression molding presses from 50 to 2500 tons, 14" x 14" through 42" x 42".*



CALENDERS *Above is 4-roll, 8" x 16" lab-production model. 2-, 3- and 4-roll from 8" dia. through 22" dia. rolls, 16" through 66" face.*





MILLS *Above left is an 8" x 20" deluxe laboratory model. Right above is a 22" x 60" production size. Eleven sizes from 2½" dia., 7" wide rolls, through 26" dia., 100" width.*

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ASRC offers you highest quality synthetic rubber . . . efficient service that is timed to your needs . . . personal attention to your orders . . . prompt shipments. You will find it pays to rely on ASRC for *quality* products and *quality* service!

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COLD	CLASS	HOT	CLASS
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ASRC 1502	Non-Staining	ASRC 1001	Slightly Staining
ASRC 1503	Non-Staining	ASRC 1004	Staining
ASRC 3110	Non-Staining	ASRC 1006	Non-Staining
COLD OIL		ASRC 1009	Non-Staining
ASRC 1703	Non-Staining	ASRC 1018	Non-Staining
ASRC 1708	Non-Staining	ASRC 1019	Non-Staining

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long life · heavy duty

HYDRAULIC PRESSES

ALL 5 PLANTS 100% EQUIPPED

EEMCO is proud to have worked with the Molded Fiber Glass Companies since 1951—and to have helped in the developing of the right presses for each particular job (custom designing and building is an EEMCO specialty). The confidence they have in our craftsmanship and engineering development is shown in their use of our presses exclusively. EEMCO builds presses, preform machines and ovens to meet your requirements.

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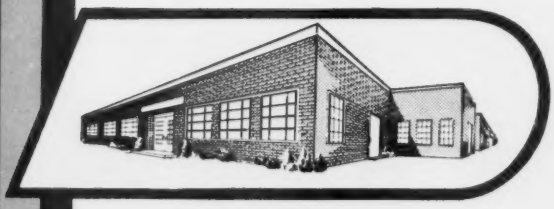
EEMCO builds a complete line of Hydraulic Presses for transfer, compression, laminating or rubber molding—with self-contained pumping units or to fit your central system. Investigate today.



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Ashtabula, Ohio

MOLDED FIBER GLASS BODY COMPANY
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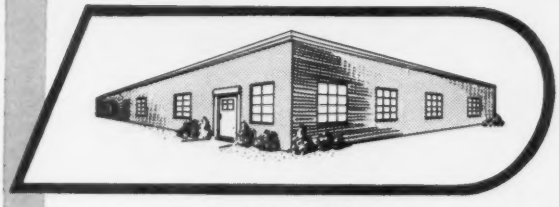
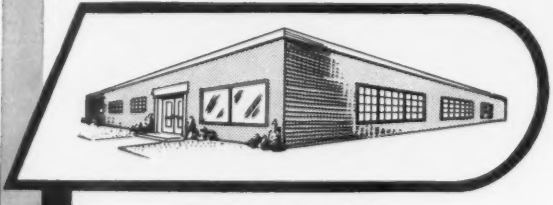


MOLDED FIBER GLASS SHEET COMPANY
Ashtabula, Ohio



MOLDED FIBER GLASS TRAY COMPANY
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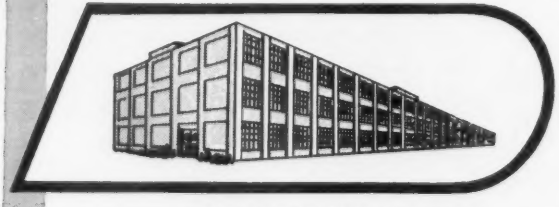

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ERIE ENGINE & MFG. CO.

947 East 12th St., ERIE, PA.

Designers and builders of a complete line of mills and hydraulic presses

Photo courtesy Ebonite Company, Newton 64, Massachusetts

It may be right down your alley, too

When you hold a bowling ball in your hands, you're holding years of experience along with a great deal of care in its manufacture. For few products are made to such exacting specifications.

That's why the make-up of a ball is never changed without careful consideration and thorough testing. That's also why it's safe to say a leading bowling ball manufacturer found PLIOFLEX rubber right down his alley for the outer shell of his product.

Surprisingly enough a bowling ball does start out as two different rubber compounds—a high gravity core and a super-tough shell. These are later fused into a hard, solid sphere. And it's to the shell that PLIOFLEX brings even greater toughness and a better finish plus extreme uniformity and easy processing – all at lower cost.

Perhaps you'll also find PLIOFLEX right down your alley for either hard or soft rubber goods. One thing certain, you'll find no finer rubber or service anywhere. For full details, write to Goodyear, Chemical Division, Dept. L-9419, Akron 16, Ohio.

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Chemigum, Plioflex, Pliolite, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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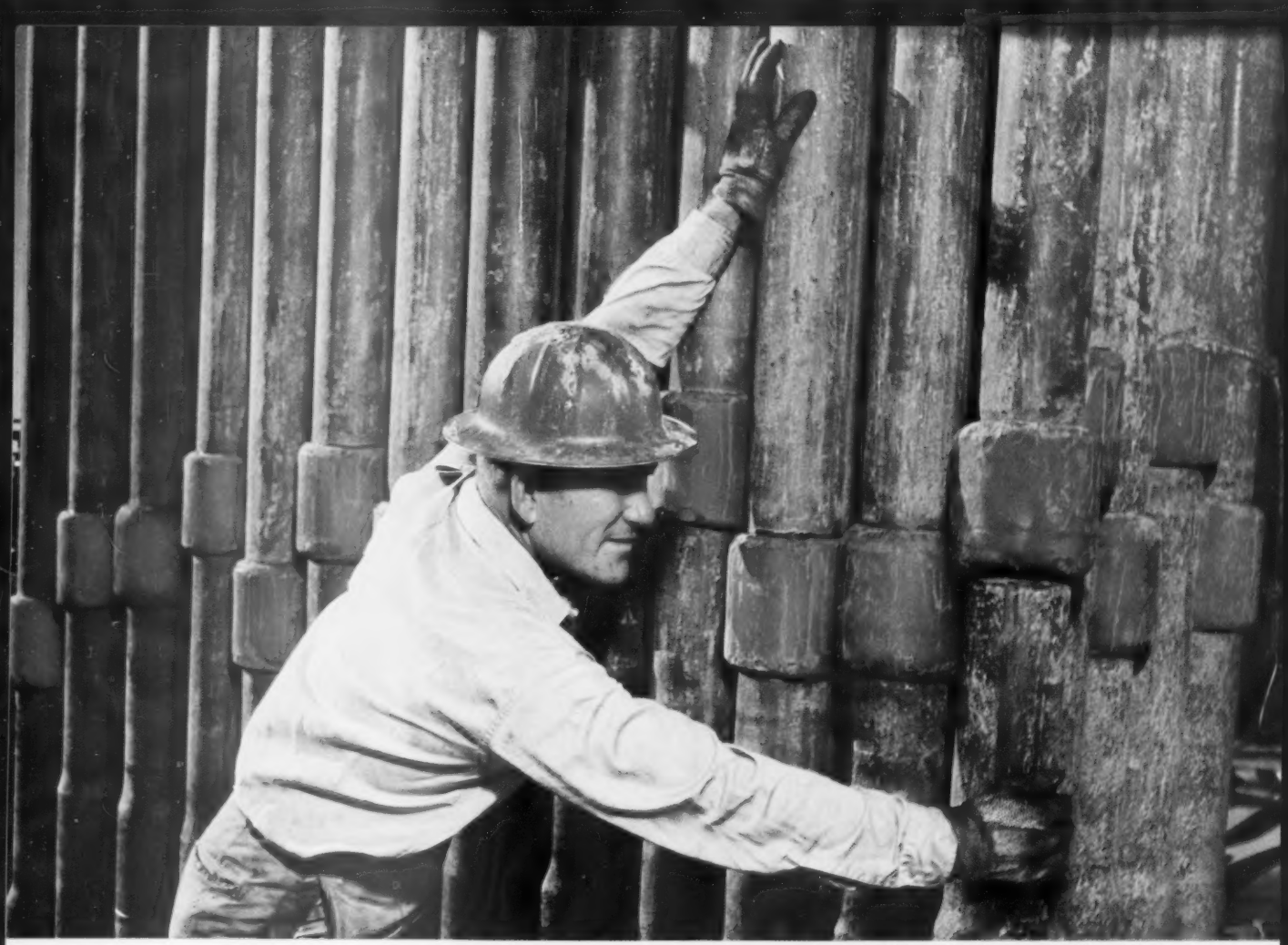
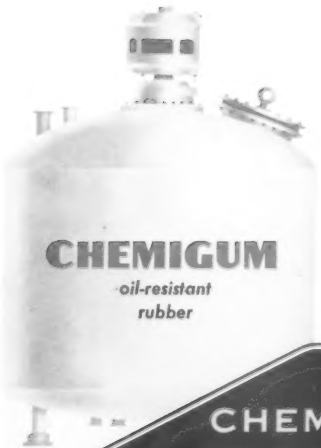


Photo courtesy Bettis Rubber Company, Whittier, California

A case of joint enterprise!



A string of hundreds of joints of drill pipe is as flexible as a fine steel wire. Uncontrolled, it rubs and slams against the casing, resulting in costly, premature wear and damage.

To protect their heavy investment in pipe, casing and tool joints, drillers first placed tough, thick collars of natural rubber on the pipe. These spacers served as efficient protectors, despite the extreme abuse and abrasion.

But the advent of oil-based drilling muds brought a new problem: they attacked the natural rubber–caused rapid swelling and deterioration.

Then an enterprising specialty molding company, in a joint effort with drilling fluid manufacturers, perfected a new compound based on CHEMIGUM – the easy processing nitrile rubber. The extreme oil-resistance of CHEMIGUM made possible a truly "all purpose" protector that fully resists the attack and abrasion of oil- or clay-based muds–and at higher temperatures than any other protector.

How can outstanding oil-resistance and physical properties of CHEMIGUM improve your product? Write for details to: Goodyear, Chemical Division, Dept. L-9419, Akron 16, Ohio.

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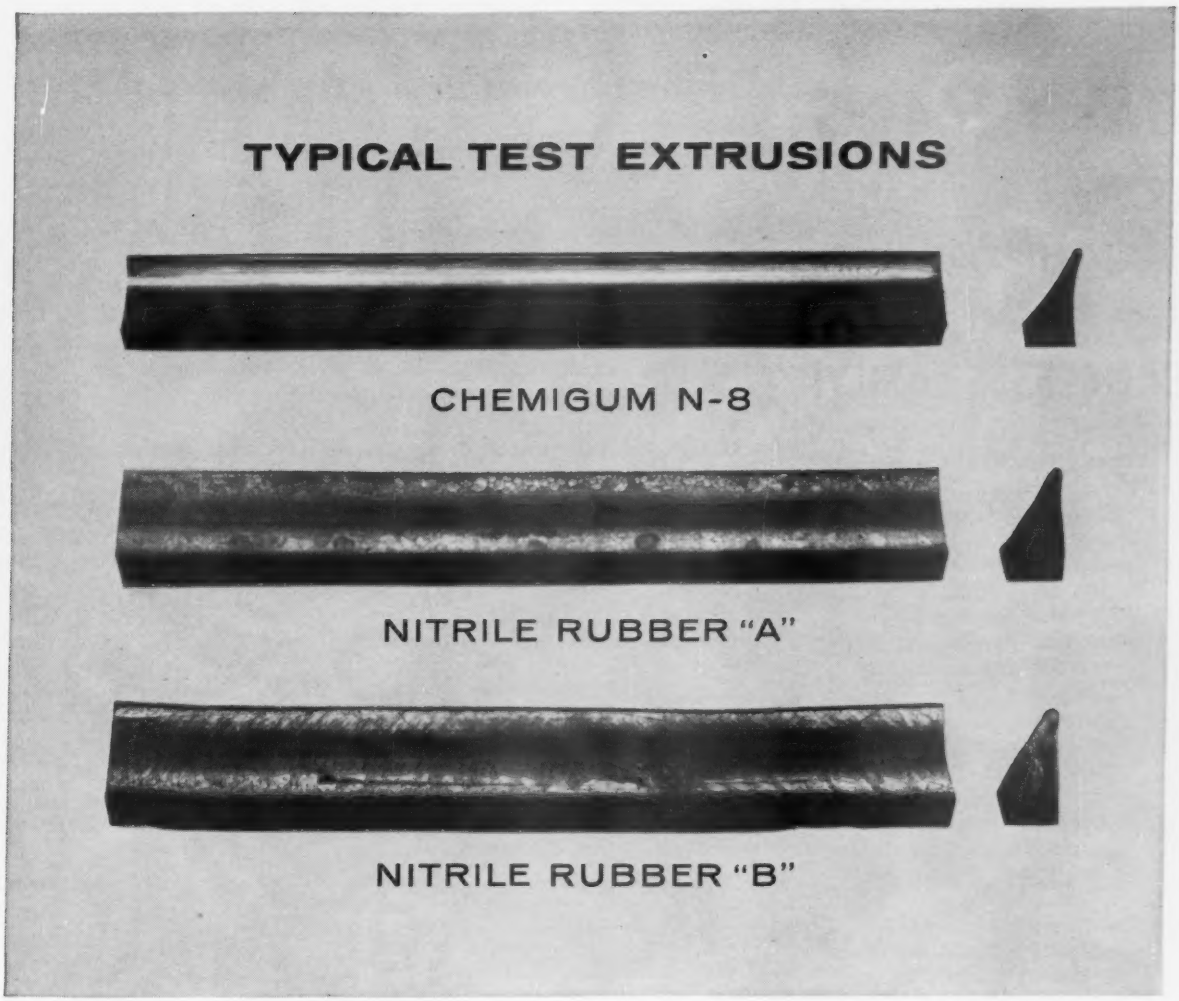

New—and straight as the die

Pictured above are some test extrusions of comparable nitrile rubbers. They tell you quickly and graphically of the improvements you can expect in extrudability with new CHEMIGUM N-8.

CHEMIGUM N-8 is a medium acrylonitrile content rubber specifically designed for applications requiring excellent extruding and calendering characteristics. It's a rubber of greatly reduced nerve as evidenced by its excellent mill breakdown, good pigment acceptance, smooth calendering, good mold flow and excellent reproduction of the die in extrusion.

When directly substituted in an existing compound, CHEMIGUM N-8 produces higher modulus along with slightly lower elongation. It also exhibits greater hardness and excellent compression set. For full details on straight-as-the-die extrusions with CHEMIGUM N-8 plus the latest *Tech Book Bulletins*, write to: Goodyear, Chemical Division, Akron 16, Ohio.

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NOW... EMERY 3049-S

a new high mol.-wt. Polymeric Plasticizer that

PROCESSES EASILY!

Emery 3049-S*, a new polymeric plasticizer, imparts all the extreme permanance properties to vinyl materials, yet processes easily on conventional equipment. In fact, 3049-S can be used as the sole plasticizer without incurring processing or compatibility difficulties.

Properties of 3049-S are those expected from the very high molecular-weight polymerics, i.e., extremely low volatility, excellent resistance to extraction and low migration. Emery 3049-S also possesses good electrical properties, excellent heat and light stability, and a combination of relatively low viscosity and good wetting that makes it an excellent vehicle for pigment grinding.

Because 3049-S can offer you more than other high molecular-weight polymerics, why not evaluate it in your vinyl formulations today? Write for sample or mail coupon below for descriptive literature.

Emery

Emery Industries, Inc.
Development and Service Department

Emery Industries, Inc.
Dept. U-12A, Carew Tower
Cincinnati 2, Ohio

Please send Development Product Bulletin on Emery 3049-S.

Name.....Title.....

Company.....

Address.....

City.....State.....

*Product in development stage

Coming Events in the Rubber Industry

Dec. 20. Chicago Rubber Group, Xmas Party, Morrison Hotel, Chicago, Ill.

Jan. 15, 1958. Washington Rubber Group.

Jan. 16, 1958. Quebec Rubber and Plastics Group.

Jan. 24, 1958. Akron Rubber Group, Sheraton-Mayflower Hotel, Akron, Ohio.

Jan. 24, 1958. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Feb. 13, 1958. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Feb. 18, 1958. Washington Rubber Group, Decennial Meeting, National Press Club, Washington, D.C.

Feb. 21, 1958. Connecticut Rubber Group.

Feb. 21-22, 1958. Southern Rubber Group, Houston, Texas.

Mar. 20, 1958. Quebec Rubber and Plastics Group.

Mar. 28, 1958. New York Rubber Group, Spring Meeting, Henry Hudson Hotel, New York, N. Y.

April 10, 1958. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

April 11, 1958. Akron Rubber Group, Spring Meeting, Sheraton - Mayflower Hotel, Akron, Ohio.

April 16, 1958. Washington Rubber Group.

April 17, 1958. Quebec Rubber and Plastics Group.

May 14 - 16, 1958. Division of Rubber Chemistry, A.C.S., Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio.

May 21, 1958. Washington Rubber Group.

May 23, 1958. Connecticut Rubber Group.

June 5, 1958. New York Rubber Group, Summer Outing, Doerr's Grove, Milburn, N. J.

June 20, 1958. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 22-28, 1958. A.S.T.M. Annual Meeting, Hotel Statler, Boston, Mass.

Aug. 5, 1958. New York Rubber Group, Golf Outing, Wingfoot Golf Club, Mamaroneck, N. Y.

Sept. 6, 1958. Connecticut Rubber Group, Summer Outing.

Sept. 10-12, 1958. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

Oct. 17, 1958. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Nov. 14, 1958. Connecticut Rubber Group.

Nov. 30-Dec. 5, 1958. A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

Dec. 12, 1958. New York Rubber Group, Xmas Party.

May 12-15, 1959. Division of Rubber Chemistry, A.C.S. Spring Meeting, Biltmore Hotel, Los Angeles, Calif.

Nov. 9-13, 1959. Joint International Meeting of Division of Rubber Chemistry, A.C.S.; Committee D-11, A.S.T.M., and Rubber and Plastics Division, A.S.M.E., Shoreham Hotel, Washington, D.C.

May 24-27, 1960. Division of Rubber Chemistry, A.C.S., Spring Meeting, Hotel Statler, Buffalo, N. Y.

Sept. 13-16, 1960. Division of Rubber Chemistry, A.C.S., Fall Meeting, Commodore Hotel, New York, N. Y.

May 16-19, 1961. Division of Rubber Chemistry, A.C.S., Spring Meeting, Brown Hotel, Louisville, Ky.

Sept. 5-8, 1961. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

May 15-18, 1962. Division of Rubber Chemistry, A.C.S., Spring Meeting, Hotel Statler, Boston, Mass.

PLASTOLEIN® 9720 MAKES VINYL UPHOLSTERY PERFORM BETTER!

Here's the permanent, polymeric plasticizer you need to make your vinyl upholstery perform better... by withstanding the abuse of constant use, resisting the deteriorating action of time and the natural elements, yet staying soft and attractive. Plastolein 9720 provides this permanence through its low volatility, resistance to extraction, low migration, and excellent resistance to heat and ultra-violet light.

In addition to such performance features, low-cost Plastolein 9720, even though a polymeric, possesses a relatively low viscosity that provides the processing advantages common to monomerics, and permits the economies of bulk shipping and handling.

With all these advantages to gain, why not try Plastolein 9720 in your vinyl upholstery—or in any formulation where extreme permanence is essential.

For complete details on 9720 or any of the Plastolein Plasticizers, mail coupon below.

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Please send 32 page Emeryfacts describing all the Plastolein Plasticizers.

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3M chemicals opening new worlds of use for rubber

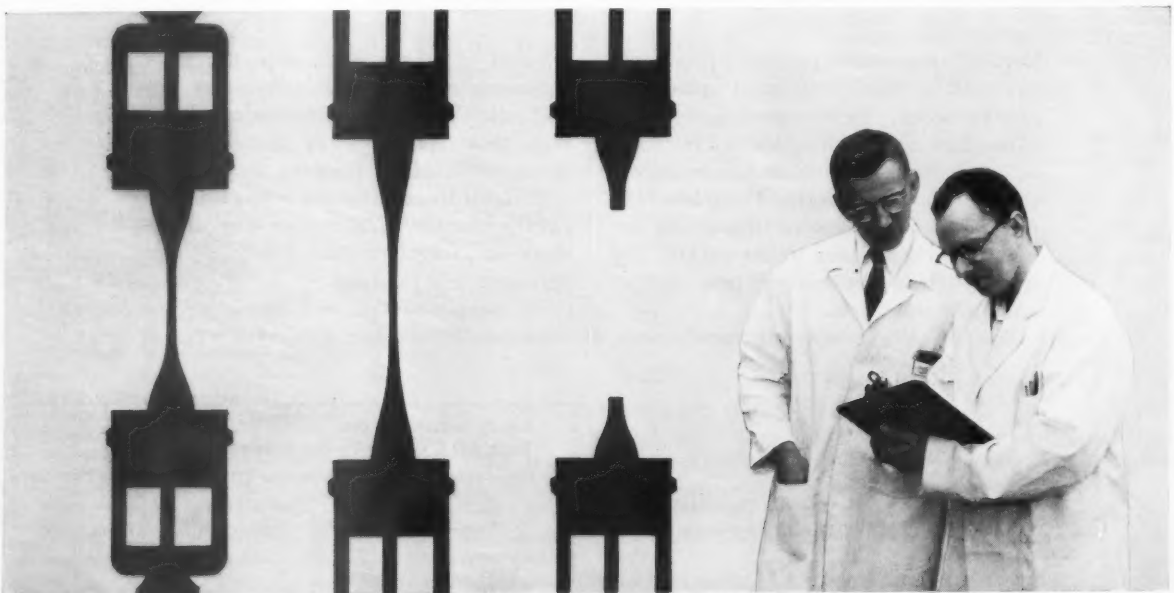
Flexibilizing synthetic rubber for use with solvents

Under solvent attack, plasticized rubbers often lose their flexibility. From 3M comes Turpol® NC-1200, a softening agent developed specifically to resist solvent action

Here is a practical answer to the problem of maintaining flexibility in synthetic rubber under prolonged exposure to solvents . . . Turpol NC-1200, a non-leachable 3M plasticizer. By adding Turpol to the formulation, softness is achieved and maintained in the base rubber despite solvent action. What's more, Turpol will not reduce the solvent resistance of the base rubber itself.

Turpol's advantages are best shown by a direct comparison. For example, standard formulation of unplasticized rubber is too hard for many applications. Under solvent exposure, swelling is pronounced.

With vulcanized vegetable oils added to the formulation, the rubber is plasticized to an extent; but after solvent attack the rubber hardens and actually loses strength. Another undesirable effect is the degree of



Rubber becomes soft, but stays tough, when non-leachable Turpol NC-1200 is added. Even after soaking in solvent, Turpol-softened rubber (center) stretches far more than unsoftened rubber (left), yet does not break like rubber softened with vulcanized vegetable oils.

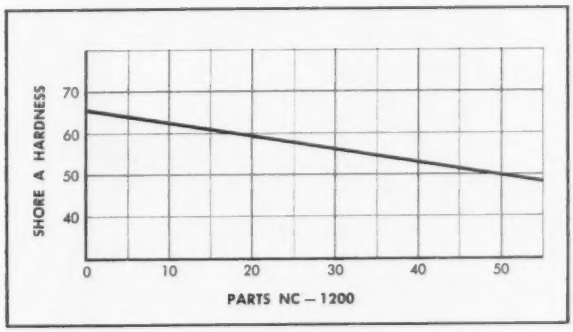
swelling—far greater than that which occurs in Turpol-softened rubber, or formulations without any plasticizer at all.

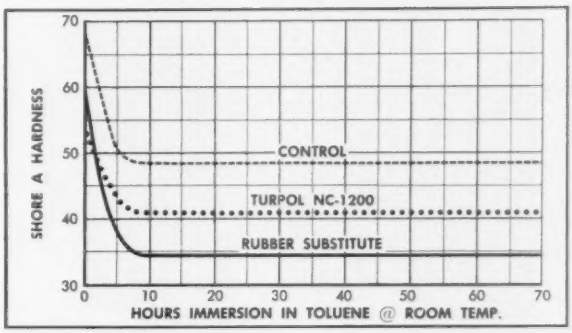
The over-all result of adding Turpol is to increase the service life of rubber in applications where it is necessary to maintain flexibility despite the presence of solvents. Turpol is already being used in formulations for printing rolls and blankets, gas and oil hose and tanks, compounds, gaskets, tank lining materials, diaphragm cloth and rubber gloves.

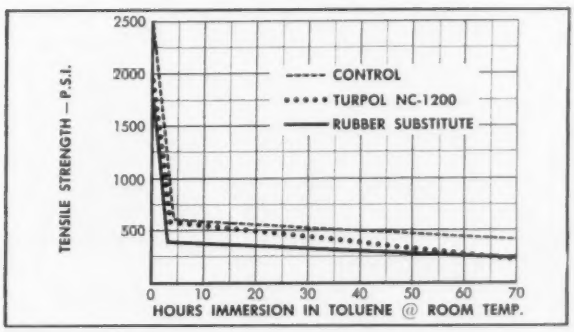
Turpol is compatible with Thiokol, Hypalon, Neoprene, and nitrile rubbers, and is especially useful in compounding low durometer stocks. It is available in slabs and is milled into the base rubber with standard equipment.

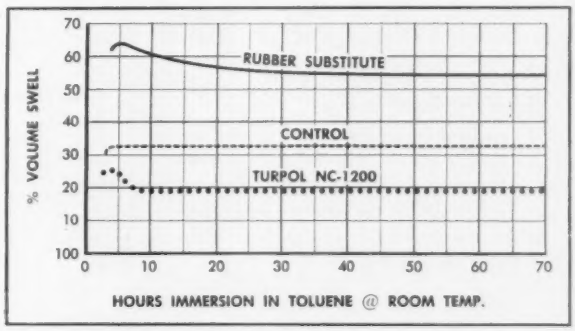
For complete data on non-leachable Turpol NC-1200 —applications and formulations—fill out the coupon below and mail it today.

How Turpol NC-1200 affects hardness, tensile strength and volume swell









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Please send latest data on Turpol NC-1200, non-leachable rubber plasticizer. I (do) (do not) wish a Field Engineer to call.

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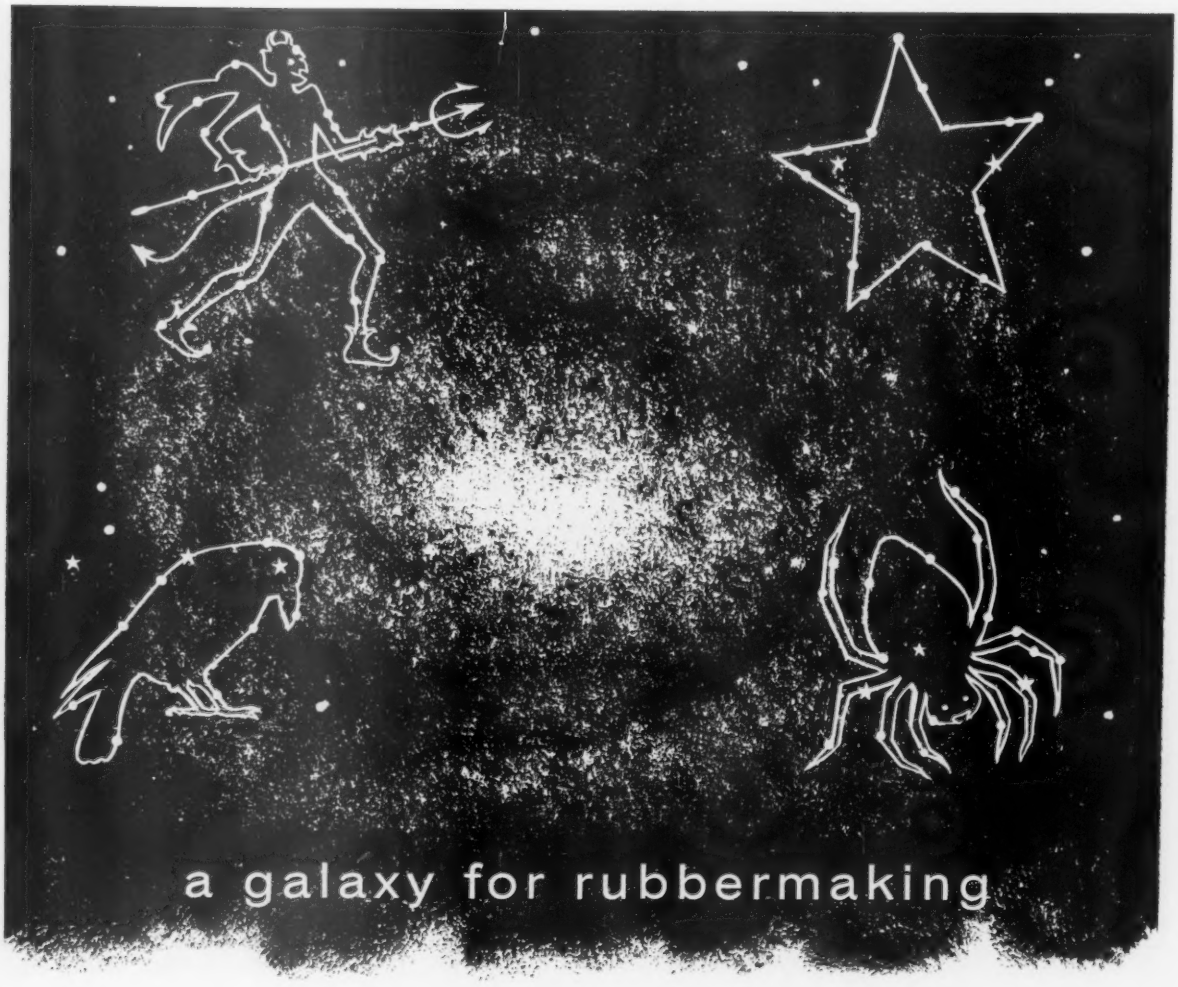
COMPANY_____

STREET_____

CITY_____ ZONE____ STATE____



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ground crude sulfur 99.5% min. purity
Grade A—90% passing 200-mesh
Grade AA—97% passing 200-mesh
50-lb. triple-wall paper bags

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ground crude sulfur with .5% carbon black added
99% min. purity
98-100% passing 325-mesh
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ground refined sulfur 99.9%-100% pure
Grade A—90% passing 200-mesh
Grade AA—97% passing 200-mesh
50-lb. triple-wall paper bags

SPIDER BRAND

ground crude sulfur with conditioner added
97% min. purity
98-100% passing 325-mesh
50-lb. triple-wall paper bags

Mathieson also offers a full line of conditioned, oil-treated sulfurs for the rubber industry. For complete information call your Olin Mathieson representative or write today.

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United Clay Mines
CORPORATION
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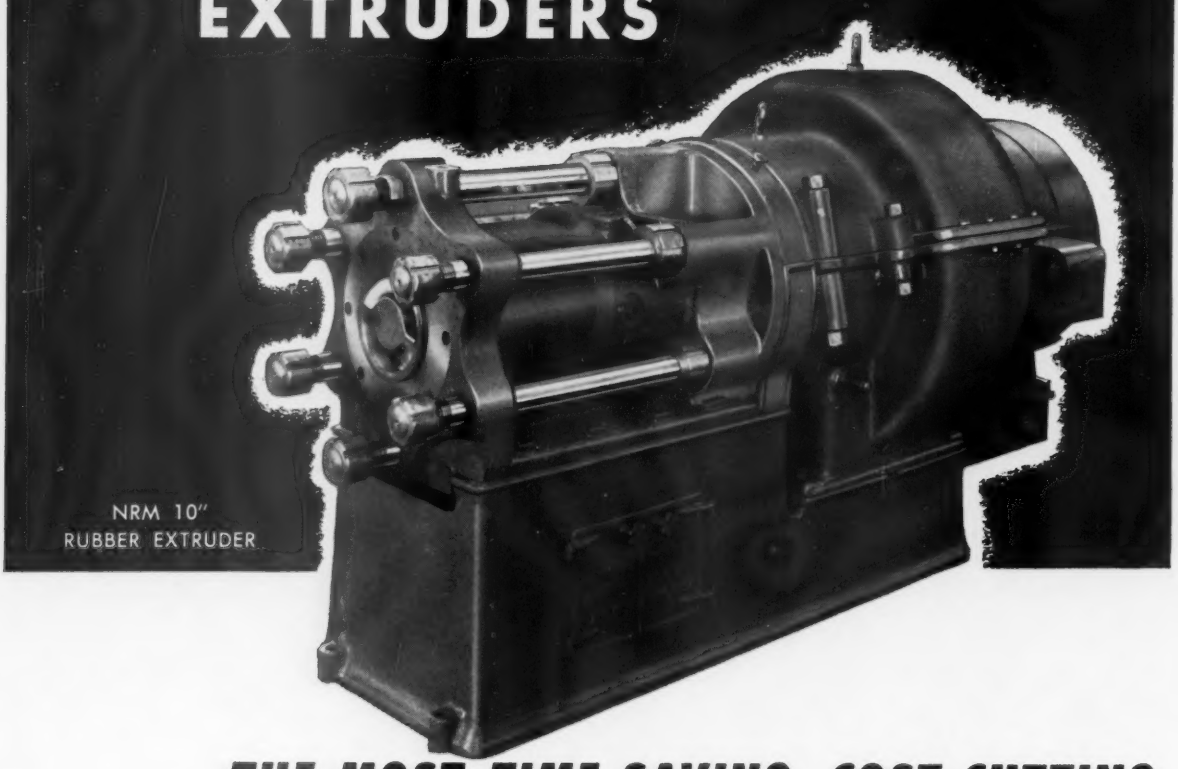
4 big advantages make NRM Rubber EXTRUDERS



NRM 10"
RUBBER EXTRUDER

...THE MOST TIME-SAVING, COST-CUTTING MACHINES IN THE INDUSTRY:

- LOW INITIAL COST
- LOW MAINTENANCE
- HIGH PRODUCTION
- L-O-N-G LIFE

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THE NRM RUBBER EXTRUDERS shown here are representative of the **full line** available to the industry in sizes from 1½" to 12". Larger Extruders to meet special requirements are produced on order. While many advanced design and construction features contribute to the four **big** advantages of NRM Rubber Extruders, the following are of special importance:

SIMPLICITY — Practical, uncomplicated design makes NRM Extruders extremely dependable and easy to operate. Compact construction makes them space-saving.

VERSATILITY— A variety of die heads make possible tube, tread, slab and other types of extrusions with a single machine, further increasing the production range of NRM Extruders.

DURABILITY — NRM Extruders are built to "stand the gaff" of mechanical rubber goods production . . . oversize thrust and radial bearings, heavy heat-treated steel cut herringbone gears, corrosion-resistant cylinder liners and hardened surface feed screws are a few of the heavy-duty construction features that assure a long life of high production at minimum cost for maintenance.

It's easy to spend more for a rubber extruder than the low first cost of an NRM, but difficult to equal the NRM quality features that help manufacturers increase profit on rubber goods production. If you are planning to purchase rubber extruders, contact us. We'll be happy to assist you in your planning, and recommend the type and size NRM Extruders to meet your requirements most efficiently and economically.

NRM 8½" RUBBER STRAINER

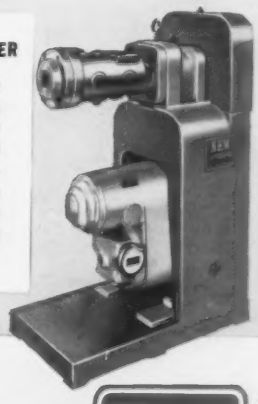
Quick-opening air-operated die heads, hinged strainer plates, undercut feed boxes . . . save time, cut costs in stock preparation.

NRM 4½" MIL-X-TRUDER ®

Turns warm-up time to production time by eliminating the need of a warm-up mill. Uses either extended smooth-bore, or fluted cylinder liners. Ideal for extruding Silicone compounds.

NRM 1½" RUBBER EXTRUDER

Never an idle moment for this machine . . . when not in laboratory work, it pays its way in actual production of small cross-sections. Materials, design and construction are the quality equal of any big NRM Extruder.



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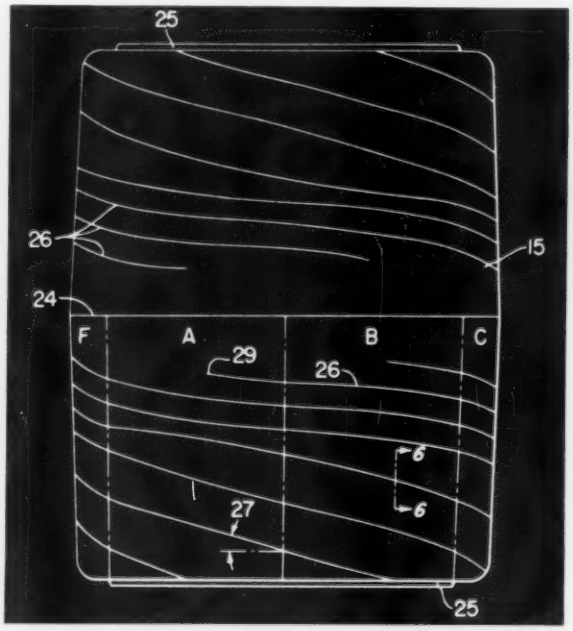
PATENT REVIEW

by Melvin Nord

Venting Bladder

U. S. 2,790,205, issued April 30, 1957 to John S. Parker and assigned to Goodyear Tire & Rubber Co., describes a curing bladder or diaphragm mounted between two rings in a tire vulcanizing press for shaping and curing a flat uncured tire band. The object is to provide a bladder which will prevent air from being trapped between it and the tire being cured, without reducing the life of the bladder by putting large ribs or grooves on it.



As the bladder (15) is expanded during the closing of the curing apparatus, the area close to its center line (24) is stretched much more than its end portion (25). Also, the bladder is stretched to a greater extent circumferentially than radially. If radial venting grooves or ribs were incorporated in the bladder, a greater stress would thus be applied transversely across the grooves or ribs than would be applied longitudinally along them, especially towards the center line (24). This would tend to cause cracking of the bladder. Therefore, spiral venting grooves (26) are used on the bladder. Each groove starts at the end (25) and extends circumferentially at a very slight angle of inclination to the longitudinal axis of the bladder. The angle of inclination decreases still

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Comes in two sizes designed to handle sheets up to 7" or 14" in width. Other sizes made to order.

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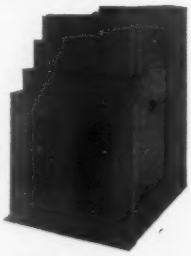
The CUMBERLAND Rotary Chopping and Dicing Machine



As a chopper, this machine efficiently cuts rubber and vinyl slabs into small pieces. Two sizes available to handle stock widths up to 14 or 24 inches.

As a dicer in modified form, handles principally vinyl sheet stock. A less expensive machine though less universal than the "Stair-Step" Dicer shown above.

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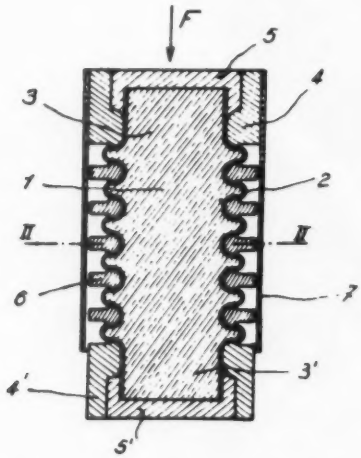
PATENT REVIEW

further as the groove approaches the center line (24) so that the resultant transverse stretching across the grooves is minimized.

Rubber-Filled Bellows

U. S. 2,800,321, issued July 23, 1957 to Jean Jarret and Jacques Jarret, describes a rubber-filled bellows which provides efficient spring and shock absorbing action.



As shown in the illustration, a mass of vulcanized rubber (1) is completely enclosed in a stainless steel corrugated bellows (2) which terminates at each end by an undeformable cylindrical part (3, 3′) surrounded by a rigid cylindrical sleeve (4, 4′). The two ends of the casing are closed by metallic plugs (5, 5′) which receive the force (F) applied to the spring. Hoops (6) of high-strength steel are arranged in the outer grooves of the bellows (2) to avoid permanent deformations. The entire spring is enclosed in a cylindrical tube (7) with one of the plugs (5) and adapted to slide on a sleeve (4′) of the opposite end, which prevents buckling of the device and protects the casing.

Unicellular Rubberlike Product

U. S. 2,788,333, issued April 9, 1957 to Jean L. Lewis and Charles F. Macy, assigned to Secretary of the Army, describes a method of producing a synthetic gas-expanded material for army cold weather uniform use, including body clothing, footwear, and handwear. It may also be used for life preservers, mats, shock-cushioning padding, mattresses, refrigerator insulation, etc.

A polymerizable mixture is used, consisting of polyvinyl chloride, a liquid copolymer of butadiene and acrylonitrile capable of further polymerization to an elastomer, together with a blowing agent and a sulfur-containing vulcanizing agent. The material is heated to

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PATENT REVIEW

a temperature of 250 to 350°F. to effect expansion of the mixture and to complete vulcanization of the rubber-like material.

Reducing Shrinkage of Filled Silicone Rubber

U. S. 2,793,198, issued May 21, 1957 to Ben A. Bluestein, assigned to General Electric Co., relates to means for reducing the shrinkage of filled silicone rubber. According to the inventor, the shrinkage characteristics of convertible organopolysiloxanes can be materially reduced if one removes, prior to curing, essentially all the volatile, low molecular weight (below 500) materials boiling below about 250°C.

Reclaiming Rubber

U. S. 2,794,006, issued May 28, 1957 to Edward A. Nandain and Clyde H. Boys, assigned to Hercules Powder Co., describes a method by which vulcanized rubber waste or scrap, including that containing fibrous material, can be readily converted to a form suitable for processing and compounding treatments and for vulcanization.

The process used is the pan process, in which ground or pulverized scrap rubber together with reclaiming aids is put into pans. These pans are placed into a reclaiming vessel, and live steam is introduced under pressure into the reclaiming vessel until the temperature is in the range of 400° to 450°F.

According to this patent, advantages are obtained in the pan process by adding to the charge 15 to 30% of a petroleum-insoluble pine wood resin. The resin imparts greater hardness and rigidity to the reclaimed rubber and to cured articles produced from it. It also facilitates further processing of the reclaimed rubber, which exhibits greater flow in molding processes.

Improved Foam Rubber Latex Products

U.S. 2,796,449, issued June 18, 1957 to Albert E. T. Neale and John Fishbein, assigned to Dunlop Tire and Rubber Corp., relates to the manufacture of sponge rubber articles from foamed rubber latex.

In making articles from unfoamed rubber latex, it is known that gelling of the latex can be brought about by the addition of phenol in conjunction with aldehydes. However, it has been observed that if in the absence of a delayed action gelling action which lowers the pH value phenols are added to foamed rubber latex, even in the presence of zinc oxide, the structure of the resulting foamed product is subject to severe splitting.

The patent discloses the fact that products having an improved internal structure are obtained if the gelling is carried out in the presence of an organic hydroxy compound which causes the gelling pH to increase by 0.3 pH

Goodrich-Gulf Chemicals, Inc.

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Types	Physical Properties*		Selection Guide
1703	Tensile	3240 psi.	An improved, lighter colored rubber, relatively non-discoloring and non-staining. Used for white and pastel colored mechanical goods, floor tile, toys, sheeting, etc.
	Elongation	650 %	
	Modulus @ 300% Elongation	990 psi.	
	Mooney Viscosity—		
	ML212°F. @ 4 minutes		
	Raw Polymer	59	
	Compounded Stock	56	
1705	Tensile	3800 psi.	General purpose pastel rubber used where color is not important . . . in tires, molded and extruded products.
	Elongation	690 %	
	Modulus @ 300% Elongation	860 psi.	
	Mooney Viscosity—		
	ML212°F. @ 4 minutes		
	Raw Polymer	60	
	Compounded Stock	57	
1707	Tensile	3170 psi.	A non-staining polymer. Used for extrusions, molded products, shoe soles and heels, etc.
	Elongation	760 %	
	Modulus @ 300% Elongation	630 psi.	
	Mooney Viscosity—		
	ML212°F. @ 4 minutes		
	Raw Polymer	55	
	Compounded Stock	48	
1708	Tensile	3280 psi.	Non-staining polymer with relatively low water absorption, improved electrical properties. Used for electrical insulation, athletic goods, coated fabrics, moldings and extrusions.
	Elongation	610 %	
	Modulus @ 300% Elongation	950 psi.	
	Mooney Viscosity—		
	ML212°F. @ 4 minutes		
	Raw Polymer	61	
	Compounded Stock	55	
1710	Tensile	3310 psi.	Similar to 1705, with higher oil content. Used for tires, molded and extruded products.
	Elongation	720 %	
	Modulus @ 300% Elongation	670 psi.	
	Mooney Viscosity—		
	ML212°F. @ 4 minutes		
	Raw Polymer	55	
	Compounded Stock	51	
1712	Tensile	3180 psi.	Used for insulation, tires, molded and extruded goods.
	Elongation	730 %	
	Modulus @ 300% Elongation	690 psi.	
	Mooney Viscosity—		
	ML212°F. @ 4 minutes		
	Raw Polymer	55	
	Compounded Stock	51	

***Typical average production values. Cure 50' @ 292°F.**

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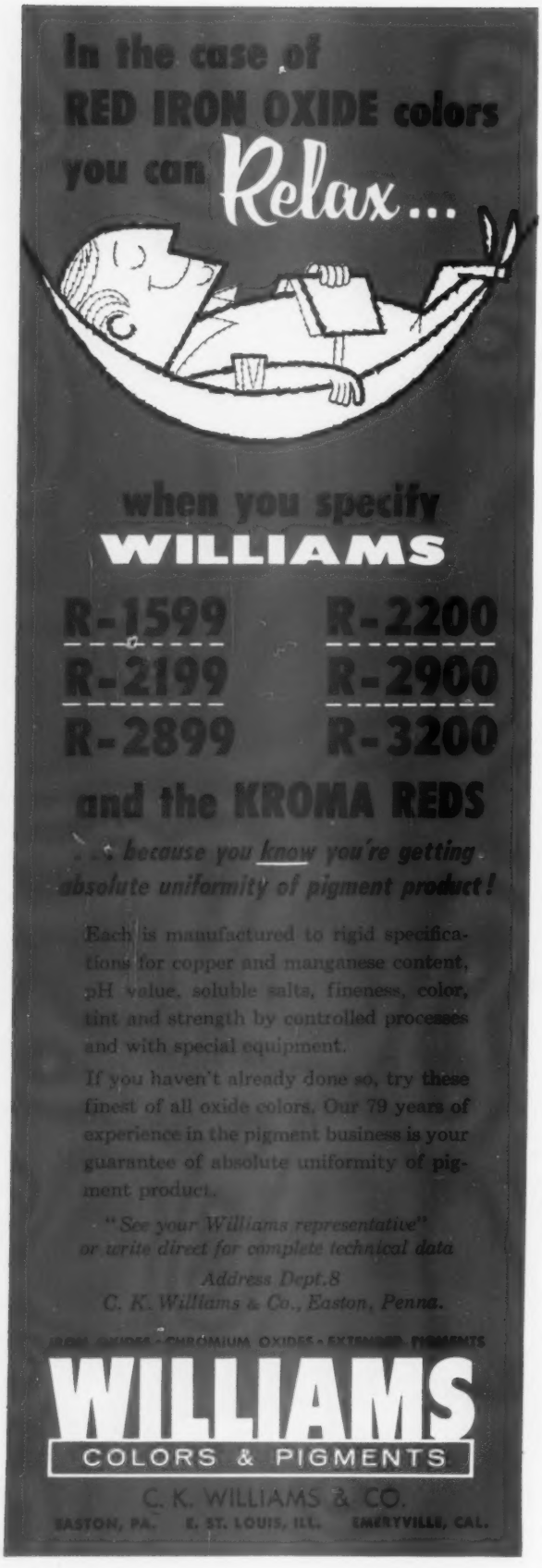
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PATENT REVIEW

unit or more. The compounds which have been found to be the most advantageous are the monohydroxy aryl compounds containing the hydroxyl group in the aryl nucleus, e.g., phenol, cresols and naphthols.

Separation of Reclaim Rubber

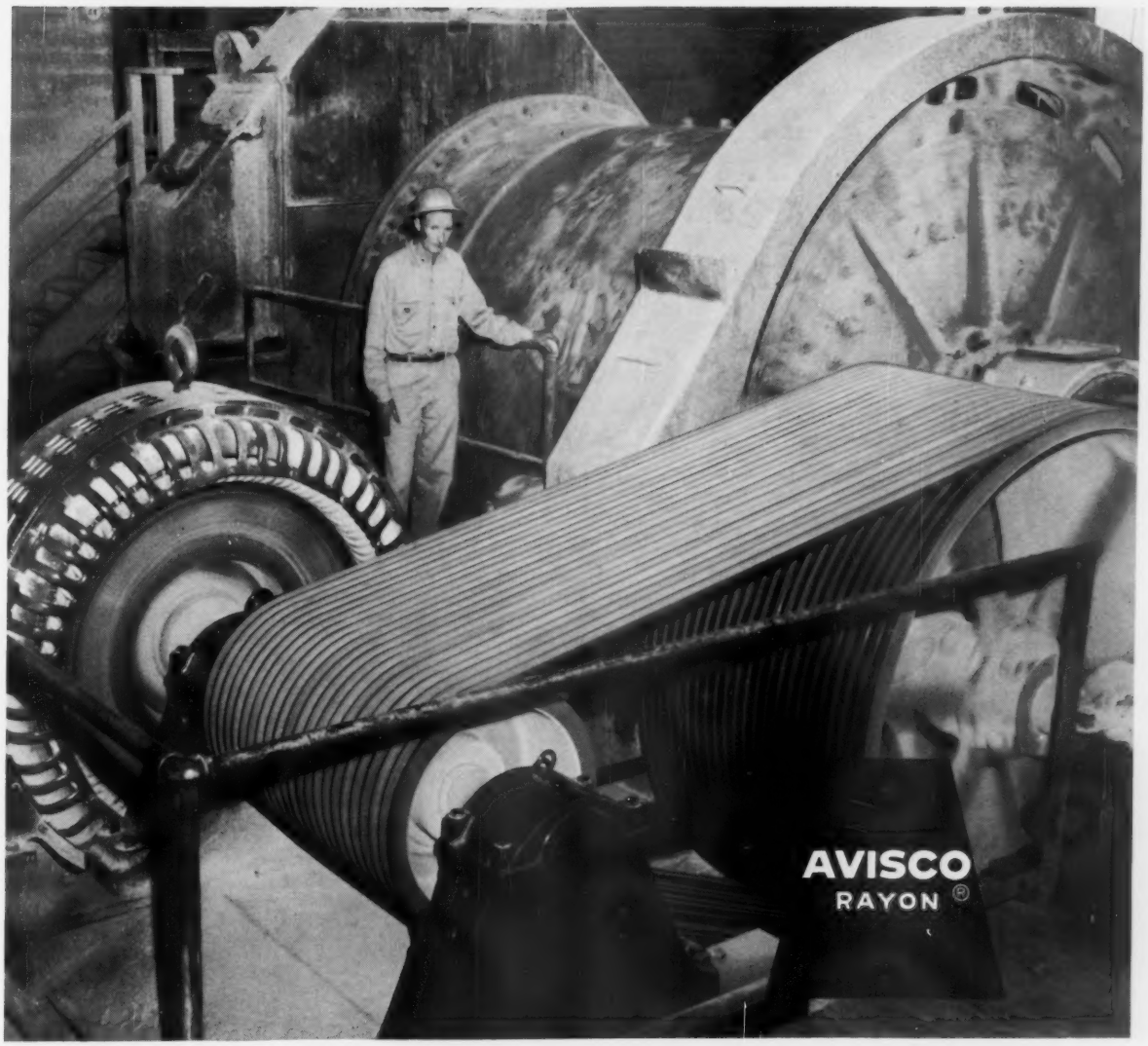
U.S. 2,794,057, issued May 28, 1957 to Arnold Gunther, relates to a process for the separation of cotton, rayon, nylon, or other fibers from the vulvanized rubber contained in scrap rubber such as old vehicle tires.

The scrap is ground to such a particle size that rubber and fiber particles will be practically free from each other, e.g., less than 30 mesh. The ground rubber scrap is then exposed at room temperature to a liquid swelling agent such as benzene or toluene, causing the rubber to swell. The swollen rubber particles are then separated from the fibers by a sink-float process, using an aqueous medium having a specific gravity between that of the fibers (about 1.5) and that of the swollen rubber (0.9 to 1.1).

Other Patents Of Interest

Subject	Inventor or Assignee	Patent No.	Date
Rubber latex compositions, including a polyoxyalkylene heat sensitising agent	Shell Development Co.	2,791,567	5/7/57
Rigid thermoplastic compositions consisting of vinyl halide polymers with interpolymers of styrene and methacrylates	B. F. Goodrich Co.	2,791,600	5/7/57
Liner sleeve for tire retreading mold	Robbins Tire & Rubber Co., Inc.	2,791,805	5/14/57
Drive belts	B. F. Goodrich Co.	2,792,319	5/14/57
Reinforced rubber articles	United States Rubber Co.	2,792,868	5/21/57
Method of making side-driving belts	B. F. Goodrich Co.	2,792,872	5/21/57
Fabric-reinforced flexible elastomeric article	British Tyre & Rubber Co. Ltd.	2,793,151	5/21/57

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.



Six years of continuous operation, without losing an hour. They're B. F. Goodrich Multi-V belts, with Avisco rayon as tough reinforcing "muscle," and they promise to last many more years. This performance since 1951, under conditions requiring greatest strength, flexibility and freedom from elongation, may suggest an application in your business. And remember, Avisco rayon gives greater strength per dollar than any other reinforcing material.

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These products and many others are now being made with the new improved 1703, 1707 and 1708 SYNPOLS. Your TEXUS representative will gladly show you the comparison case illustrated. See for yourself how these improved SYNPOLS can benefit your product line.

...and no need to change compounds

New improved 1703, 1707 and 1708 SYNPOLS continue to meet with unprecedented acceptance!

Rapidly adopted by TEXUS customers for all existing uses of these polymer types, the new 1703, 1707 and 1708 SYNPOLS are now finding even wider product application because of the unique combination of properties they offer.

In addition, these new TEXUS SYNPOLS prove to be 100% interchangeable... number for number... with previously used dark-colored, oil-extended rubbers of the same types. They also answer the need for light-colored rubbers extended with an oil which is non-volatile at the high temperatures experienced in modern high-speed mixing equipment.

Resulting from the development of a new, non-volatile pale naphthenic oil used exclusively in TEXUS SYNPOLS, these improved polymers offer the technical advantages of:

HIGH PHYSICALS—important in regular and cellular shoe soles;

BRIGHT AND LIGHT COLORS WITH ECONOMY—an obvious must in the manufacture of floor tile, toys, molded household goods and products requiring a high degree of transparency;

LOW WATER ABSORPTION*—resistance to water absorption is a vital consideration in such products as athletic equipment, industrial rollers and various types of mechanical goods;

EASE OF PROCESSING—necessary in smooth-finish calendered products such as waterproof sheeting.

*SYNPOL 1708 has low ash content and water absorption values similar to those formerly found only in premium priced rubbers.

Extensive factory tests and current use of the new 1703, 1707 and 1708 SYNPOLS in product manufacture by present TEXUS customers eliminate your need of extensive testing when adopting these light-colored polymers for your present product line. In addition, the outstanding characteristics of these improved SYNPOLS now offer exciting possibilities for your new product development. Call on TEXUS Technical Service for complete assistance.

PRE-TESTED COMPOUNDING FORMULAS are yours in this new Technical Bulletin on SYNPOL 1708

Actual cost-tested compound formulas for Molded Soles, Code Wire Insulation, Floor Tile and other products are included in the new SYNPOL 1708 Bulletin. In addition, you will find complete specifications, physical and chemical properties and typical production values of this improved TEXUS SYNPOL. For your free copy, contact your local TEXUS representative or Naugatuck Chemical, Naugatuck, Conn.—SYNPOL Sales Agent.

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This is another example of how fabrics made by Mount Vernon Mills, Inc. and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

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The Shell Chemical plant at Torrance, California, produces 22 different butadiene-styrene synthetic rubbers—hot, cold, oil-extended and black masterbatch rubber, as well as hot and cold latices. Our Technical Service Laboratory is always ready to work with you in determining which of these will best serve your purposes.

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SHELL

Capitol Cues

THE BUSINESS PATTERN FOR 1958 is beginning to take definite shape. On the whole, it looks like another year of high-level activity—much like 1957. There may be a slight easing, over-all, in the first half; some lines will "readjust", or "shake-down", while others keep rolling along briskly. But the dip is expected to be short. Business will firm later in the year.

You can now measure the factors that will set the tone for '58 with some precision. Spending for new capacity will drop 5% to 10%. Government outlays, once scheduled to fall 3% or 4%, will actually be a plus factor during 1958. The President and Defense Secretary McElroy have already ordered spending hikes. And more are due. Defense spending will set the tone in '58.

- Some areas will ease—appliances, commercial building, factory production, employment, transportation, and the stock market.
- The areas of strength that will keep business high include consumers' incomes, most soft goods, and public construction.

CREDIT PROBABLY WON'T GET MUCH TIGHTER, say federal money officials. This is still a tentative conclusion. But the Washington money managers are beginning to feel that their policy of tightness is ready to pay off. In other words, they think the pressure of inflation will start to abate.

Here are the signs that prompted this shift in viewpoint:

- Recent interest rate rises have induced added savings, and demand for investment capital is ready to level off.
- The volume of bank loans has fallen since the end of June, at a time when it always soars. So demand won't lift loan rates.
- The declines in stocks and raw materials prices reflect a more cautious attitude on the part of business and investors.

For the first time in years, officials see easing as possible.

EISENHOWER IS SHOOTING FOR A TIGHT BUDGET for fiscal 1959—the one he must submit in January. His target is a spending total of $70 billion, almost $2 billion under what's estimated for the current year (fiscal '58). He has already rejected the first requests of several agencies as too high. New programs—school-construction, federal pay raises, etc.—may lose out.

In the face of pressure to boost defense spending—especially for missiles—the President is determined to have a surplus big enough to permit a tax cut next year. He may not succeed with the cuts. But that may not stop his efforts at relief.

IS RUSSIA LOOKING FOR A SHOWDOWN WITH THE WEST, now that it has fired an intercontinental missile and talks tough over Syria and the Middle East? Our officials say NO—war is NOT more likely as a result of developments. What Russia is up to is the usual story...in the view of most U.S. experts... trying to gain ground just by propaganda and diplomacy without firing a shot. This time the bluster is to cover a final coup in Syria and Arab dominance.

Washington is worried over Russia's missile lead. You see this in Dr. Kilian's appointment as Ike's scientific adviser and the Pentagon's reorganizations. Ike said he was not worried to reassure this country's Allies...and the voters here at home.

Continued on Next Page

DON'T RULE OUT TAX CUTS FOR INDIVIDUALS in 1958, despite the recent bad Budget news. That's the word still coming from federal tax officials. There probably won't be any surplus next June as had been hoped for, so a big tax cut would put the Treasury back in the red. But Congress' wish to cut is strong. And it can always find the necessary excuses; it has done so in the past. The final vote depends on business conditions next Spring.

The Budget may be disregarded by Ike and Congress if business reverses present trends, slumps and seems to need stimulation. And election-year politicking will add extra push to a drive.

- Democrats want an increase in exemptions from $600 to $700.
- Eisenhower would prefer cuts across-the-board—perhaps 10%.

THERE WILL BE PLENTY OF "SPECIAL" TAX ACTION next year, regardless of what happens to individual income taxes. There are scores of technical changes that Congress wants to make—to plug loopholes in present law, to eliminate inequalities, and to make the Tax Code more uniform; many of these are non-controversial. Congress will also want to help small business.

Here are some of the special changes to be considered:
- Estate taxes may be made payable over 10 years where prompt payment would force sale of an otherwise solid family firm.
- Rapid depreciation of newly purchased used equipment may be authorized...same as for new equipment at the present time.
- Freight tax of 3% is a good candidate for repeal in 1958.
- Retail excises may be reshuffled to make for consistency... those on luggage, some appliances, private swimming pools.
- Non-payment of taxes withheld from employee payrolls will mean stiffer penalties for employers who "borrow" the funds.

The House has already acted on many of these proposed changes. Key Senate Finance Committee members favor action, too.

WHAT HAPPENS TO A TAX RETURN, once it has been dropped in the mail? In a recent talk to accountants, the Internal Revenue Chief told the story. All forms filed, he noted, are checked—most routinely, some in much detail. First arithmetic is checked, and fishy-looking returns...those that claim relatively large refunds or deductions...are put aside for thorough audit.

The Revenue Service also makes complete reviews as follows:
- All high returns with adjusted gross income over $25,000.
- Cash businesses where checks and vouchers are rarely used.
- Suspect lines, proven to be error-prone by past experience.
- Income sources not subject to withholding—much as dividends.
- Low-bracket returns, sampled as a check-up on compliance.
- Special industries, chosen by local offices for full audit as time permits. One year it may be doctors—next, salesmen.

Note: Taxpayers shouldn't take audit of returns as reflection on integrity. Audits produce refunds as often as new bills.

INCREASES IN HOSPITAL INSURANCE RATES are coming in months ahead—in charges employers and/or employees pay for Blue Cross, etc. Hospital costs are up 30% since 1952—higher wages and drugs, plus expanded service, too. Hikes will average 25%, and even as high as 40% in some places like New York.

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FOR RUBBER: Unconditionally recommended by leading chemical firms for permanent type coatings on molds and latex dipforms. Permanence and durability unparalleled even in costlier products.

FOR POLYURETHANE FOAM: Unusually effective, with no transfer from mold to cause defoaming action. Average material cost is 1¢ per square foot treated.

FOR EPOXY RESINS: Unusually satisfactory release of epoxy resins from molds or other materials from epoxy resin molds. Users report unprecedented numbers of releases from single application with virtually no build-up on mold. Excellent heat stability, even at elevated temperatures. Superior finish on molded products.

FOR ICE: Thousands of instant ice cube releases logged with no indication of diminishing effectiveness. Does not chip, flake or peel from surfaces treated. FDA approved.

FOR FOOD: Currently being used to carry cast iron skillets through seasoning phase with no sticking. Reported "most permanent and effective ever found" for release of food particles from utensils. FDA approved.

AS RUST INHIBITOR: Low-alloy aluminum protected with a one-treatment film less than two-tenths of a mill thick has endured *more than 11,000 hours* of standard salt spray testing with no evidence of corrosion. Controls failed within 48 hours. Testing continues.

We will be pleased to send full information. Simply mail coupon at right.

PenSil **PENINSULAR SILICONES, INC.**

Houseman Building — Grand Rapids, Michigan

PenSil products for rubber molding industry are nationally distributed by the C. P. Hall Company.
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SEND DATA ON NEW SILICONE RELEASE AGENT IMMEDIATELY

I am interested in the following applications:

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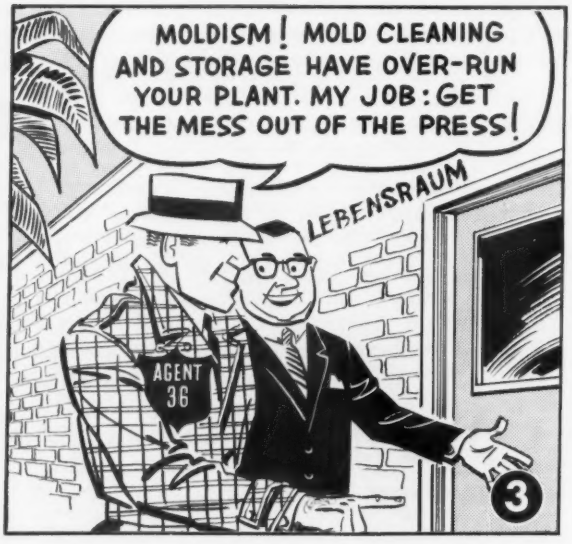
AGENT 36

SILICONE SQUAD

"HOW I SOLVED AN INSIDE JOB"

FROM THE OFFICIAL FILES OF DOW CORNING



HERE'S A CLEAN ONE BOSS!
LET'S SHAKE, RATTLE, AND MOLD!
AL SHOOKUP
AGENT 36
4
WAIT-LET ME POLISH OFF YOUR CLEANING PROBLEMS PERMANENTLY WITH A BURST OF DOW CORNING SILICONES.
AGENT 36
5
SILICONES LOWER THE BOOM ON GLOOM AND DOOM. MOLDS SHINE, STAY FINE ON THE PRODUCTION LINE.
AGENT 36
6
DOW CORNING 36 EMULSION CUTS MOLD MAINTENANCE, GIVES QUICK RELEASE, REDUCES SCRAP, SPEEDS PRODUCTION.
YOU'RE PERFECT, 36.
AGENT 36
7
THIS IS THE PLANT, SEE HOW MUCH ROOM THEY HAVE FOR PRODUCTION NOW. YOU CAN DO IT TOO. CALL ME.
GUTTA PERCHA GRILL
FLOOR SHOWS
MOVIE TODAY
AGENT 36
8
YOU CAN'T FIND A BETTER RELEASE AGENT THAN 36 EMULSION. GET YOUR FACTS. DOW CORNING'S THE SOURCE. DO IT NOW!
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Dow Corning CORPORATION
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great expectations

YOU CAN COUNT on Argus to more than fulfill your expectations. Argus Mark stabilizers and Drapex plasticizers give unmatched performance. Argus products are the industry's standard.

Nothing, for instance, overcomes vinyl processing difficulties or insures high quality in calendered products like Argus Mark M. With a Mark M stabilizer system, the problem of roll plate-out is eliminated and excellent heat and light stability are gained. The end product — like the tablecloth shown above — has clear color, excellent printability, outstanding heat-sealing characteristics and resists sulphide staining.

Whatever your vinyl formulation problem, *Argus has the answer*—in line products or in our research laboratory. Write for technical bulletins and samples.

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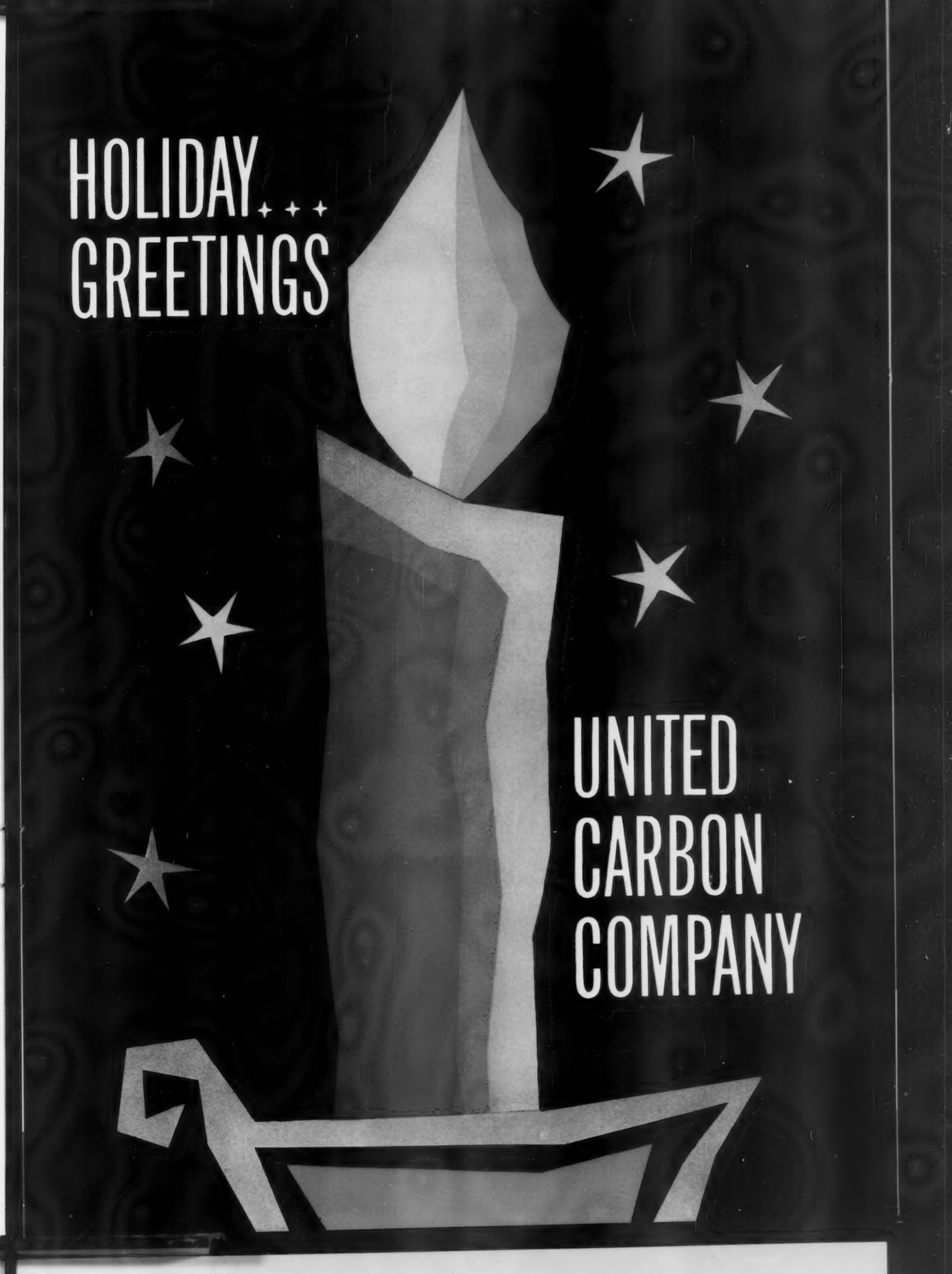
Rep's.: H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles; Philipp Bros. Chemicals, Inc., 10 High St., Boston; H. L. Blachford, Ltd., 977 Aqueduct St., Montreal.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KOSMOS 60 satisfies from the very start with fast mixing, dependable extrusion, tight cure, outstanding reinforcement, high resistance to tear, abrasion and flex, and enviable road wear performance.

KOSMOS 60 has all it takes to meet keen competition and the exacting demands of the rubber industry.

UNITED BLACKS have earned a name for themselves. Standardize on **UNITED BLACKS** to improve your products.

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BLOOM REDUCTION

A-SLIGHT BLOOM
(GR-S Cable Jacket Compound)

B-NO BLOOM

C-HEAVY BLOOM
(Nitrile Rubber—Sulfurless Cure)

D-SLIGHT BLOOM

E-NO BLOOM

with blends of 'SHARPLES' brand Ultra Accelerators

These photographs of rubber samples illustrate surface bloom one year after curing . . .

. . . the tests indicate that, in these two cases, blends of Ethyl and Methyl ultra accelerators will produce less bloom than either one used alone.

Illustrations A and B show the effect of using a blend of Ethyl and Methyl Ziram instead of straight Methyl Ziram in a GR-S Cable Jacket Compound. Photo B shows that bloom has been greatly reduced. The accelerator ratios used were as follows:

	A	B
Sulfur	2.0	2.0
MBTS	2.0	2.0
SA-57 (Methyl Ziram)	1.5	0.7
SA-67 (Ethyl Ziram)	—	0.8

Illustrations C and D show the bloom resulting when either Methyl Thiram or Ethyl Thiram is used alone in a Nitrile Rubber-Sulfurless Cure compound. Photo E shows that bloom has been greatly reduced by using equal parts of Methyl and Ethyl Thiram. The ratios used were as follows:

	C	D	E
SA-52 (Methyl Thiram)	3.0	—	1.5
SA-62 (Ethyl Thiram)	—	3.0	1.5

Blends of 'Sharples' brand Ultra Accelerators may be helpful in reducing bloom in your formulations. Technical Report S-122 and samples sent on request.

Pennsalt Chemicals

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IN SOLVENT CEMENTS. Compatible and reactive with nitrile rubber, Durez resins afford close control of film reinforcement, hardness, and flexibility. In Neoprene solvent cements, these resins add film strength and provide control of solvent release with good adhesion to a variety of surfaces.

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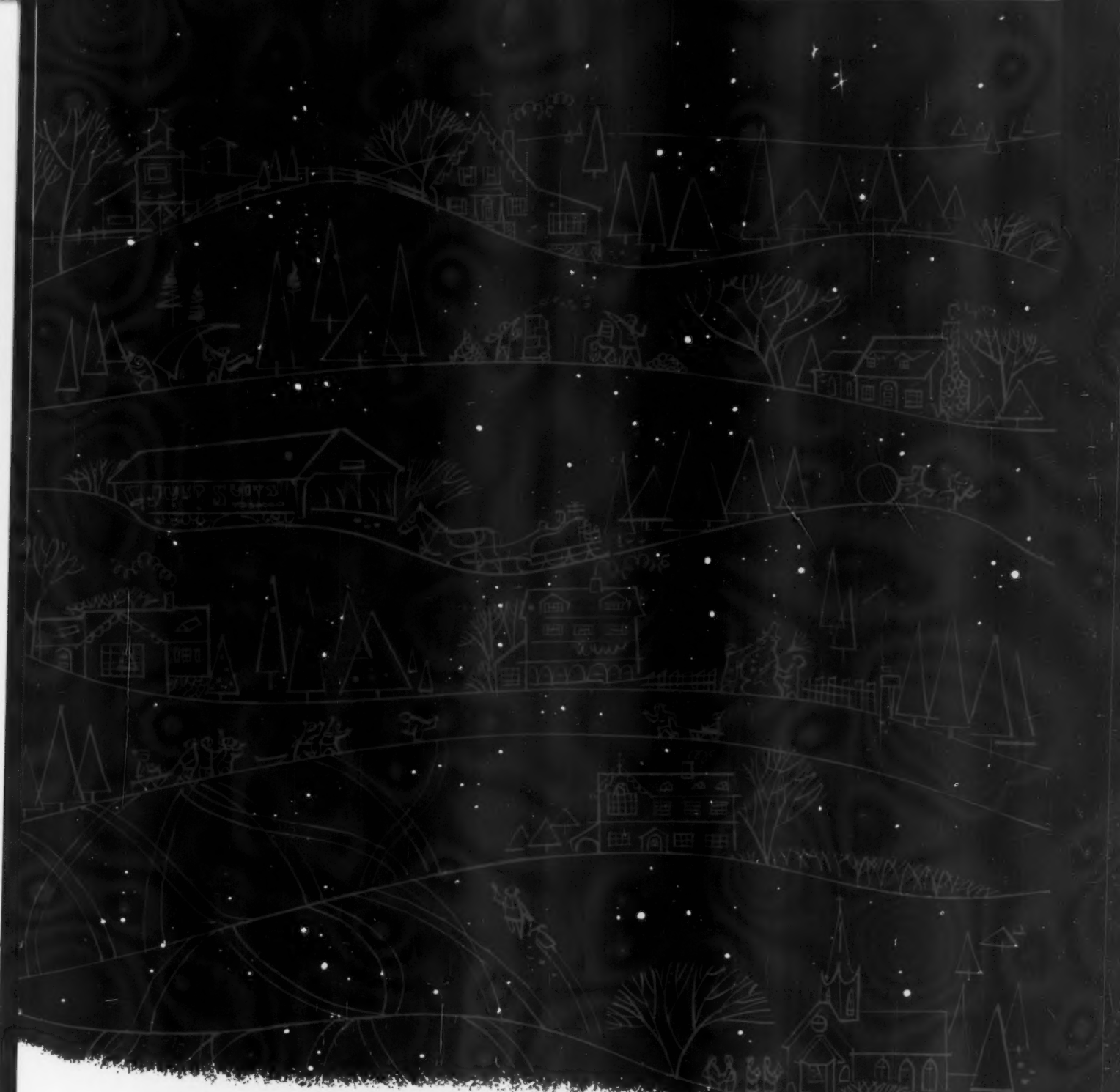

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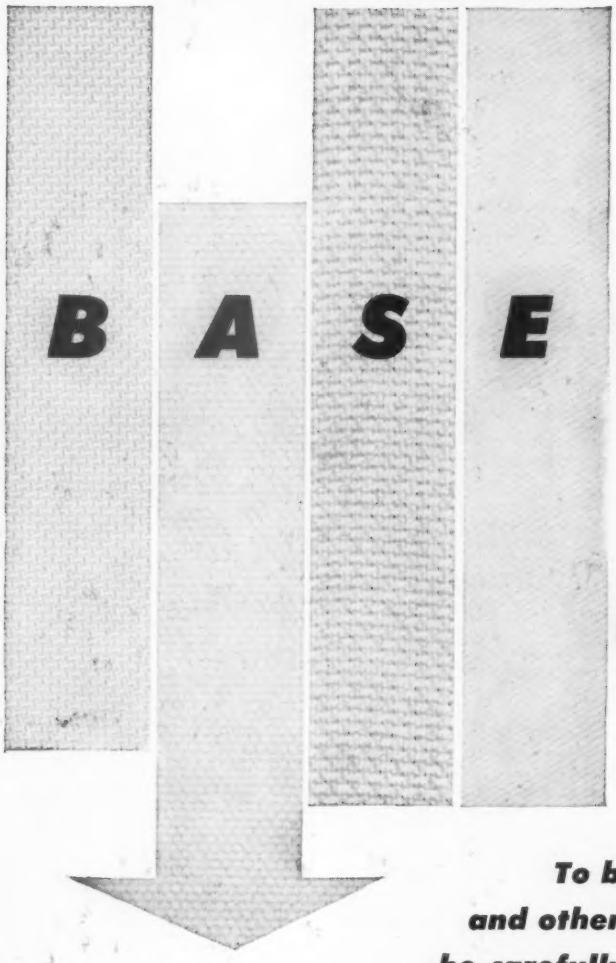

a BASE fabric's work is only as good as its bond!

To bond well with plastic, rubber and other materials, base fabrics must be carefully selected for the specific job

The success of end products made through the coating, laminating, combining or frictioning of a fabric often depends on how well that base fabric bonds or unites with the vinyl, neoprene, natural rubber, phenolic resins, etc.

At Wellington Sears, many factors are considered in choosing a base fabric. These are related to the job to be done, and the materials to be united with the fabric. Some are: fiber affinity for these materials; form in which fiber and yarn are used; effect of yarn twist, thread count, fabric sizing, and special fabric treatments. Further, the base fabric must meet requirements as to flexibility, strength, weight and other characteristics before it gets a final okay. With such care (and a century of experience) working for you, you're in good hands whenever you take your working-fabric problems to Wellington Sears! For informative booklet, "Fabrics Plus," write Dept. G-12.

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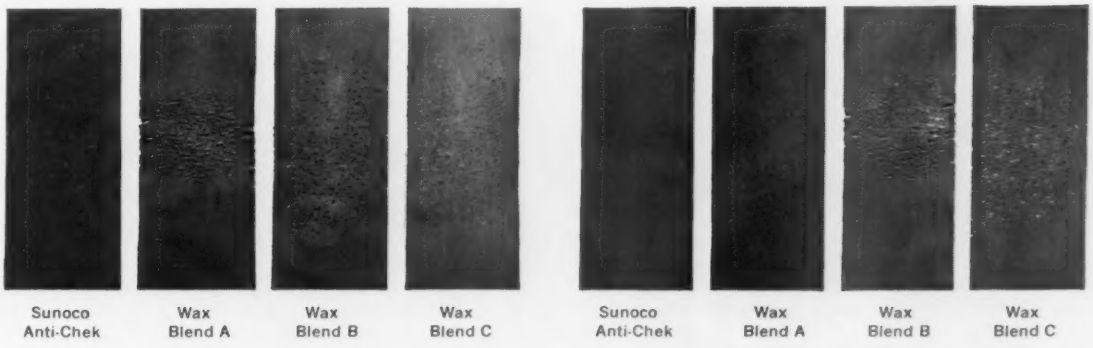

YOU NEED LESS SUNOCO ANTI-CHEK. Rubber test samples above show that it takes less Sunoco Anti-Chek to give your finished rubber products prolonged protection against checking and cracking. *Pound-for-pound, Sunoco Anti-Chek has proved best.*

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The controlled blooming rate of Sunoco Anti-Chek® gives *predictable* long-life weather-protection to your finished rubber products. Unlike ordinary waxes, that bloom too fast to last, Anti-Chek blooms at the optimum rate for longest service life. Result: You need *less* Sunoco Anti-Chek to get *better* resistance to sunlight, ultraviolet light, and ozone than ordinary waxes can provide.

Consistent quality and bloom rate from batch to batch of Anti-Chek are assured through the controlled refining process that *only* Sun waxes are put through.

Learn all the advantages of using Sunoco Anti-Chek. Ask your Sun representative or write for Technical Bulletin 30, SUN OIL COMPANY, Philadelphia 3, Pa., Dept. RA-12.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

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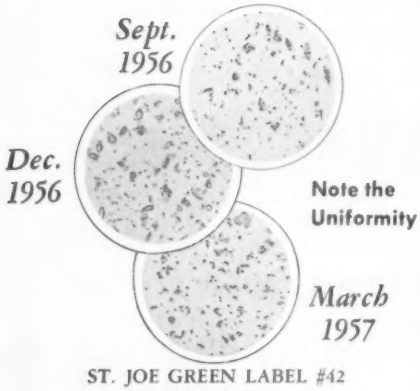

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When a well-used Banbury, like the one in the upper photo, is received at the Farrel-Birmingham plant, it is dismantled and cleaned in a degreasing tank. All parts are then inspected, magnafluxed for hidden cracks, their condition recorded, and instructions given for repair or replacement.

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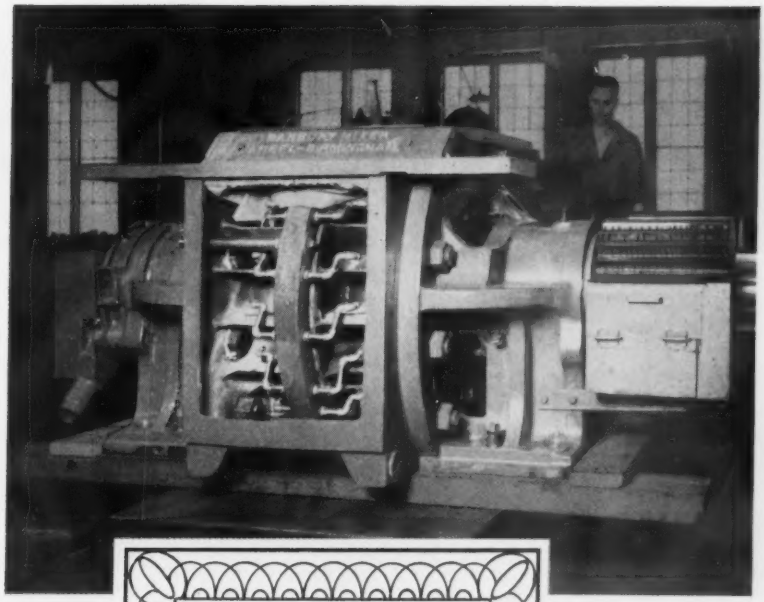

machined to jigs and fixtures in accordance with the original plans from which your Banbury was made.

In rebuilding a Banbury mixer there is no substitute for the experience and facilities on hand at Farrel-Birmingham. This company has the knowledge of all improvements that have been developed, which may be advantageously applied to your repair job; also the special equipment required to do the job best. Result: Banburys rebuilt at Farrel-Birmingham deliver new-machine performance... carry a new-machine guarantee.

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superior ozone resistance ● greatly increased flex life ● even higher abrasion resistance

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The compounding secret that makes PARACRIL the *ideal all-around oil-resistant rubber* is available to PARACRIL users from Naugatuck's synthetic rubber and rubber chemicals technical representatives. Write or wire to have one of them call on you.

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130 Years in Web Processing

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. . . are processed with ROSS-WALDRON Cord Tensioning, Gum Dipping & Drying Units for Rayon and Nylon Tire Fabrics

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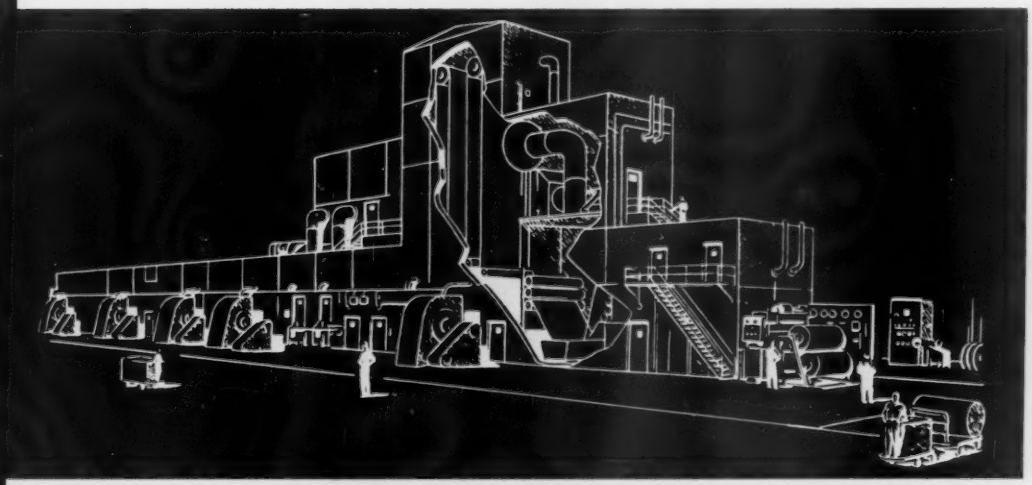
Since 1921, the ROSS-WALDRON team has handled many thousands of projects from unwind through saturating, impregnating, coating, dipping, laminating, baking, drying, curing or other conditioning, to the final rewind of the processed web or sheet.

Illustration shown below is a unit installation designed and built for Goodyear Tire & Rubber Co.



Over 80 Ross-Waldron Units are in operation in the following countries:-

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JOHN WALDRON CORPORATION, established in 1827, has always been in the specialized field of web-processing and pioneered in the converting of rubber, plastics, textiles and paper. Waldron Engineers have designed and constructed machinery for saturating, laminating, coating, embossing, printing of 'webs' of materials including winders, rewinders, tension devices, web guides, cooling rolls, suction-rolls and conveyors.

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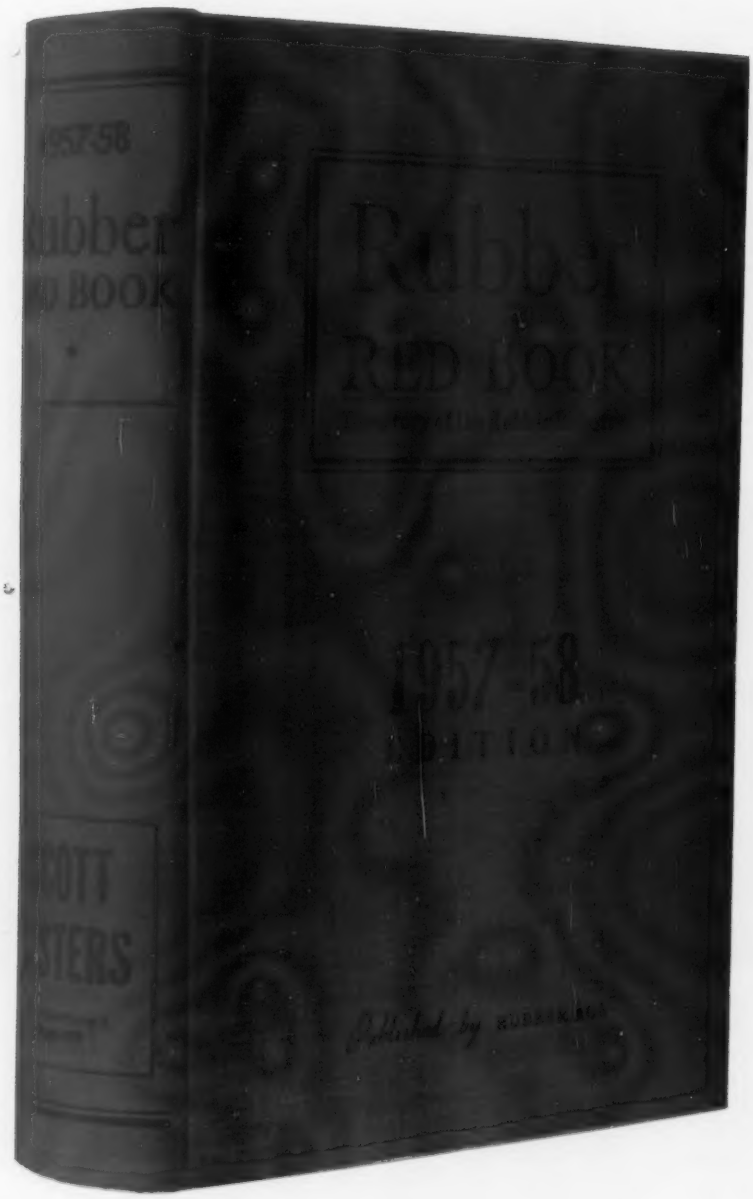

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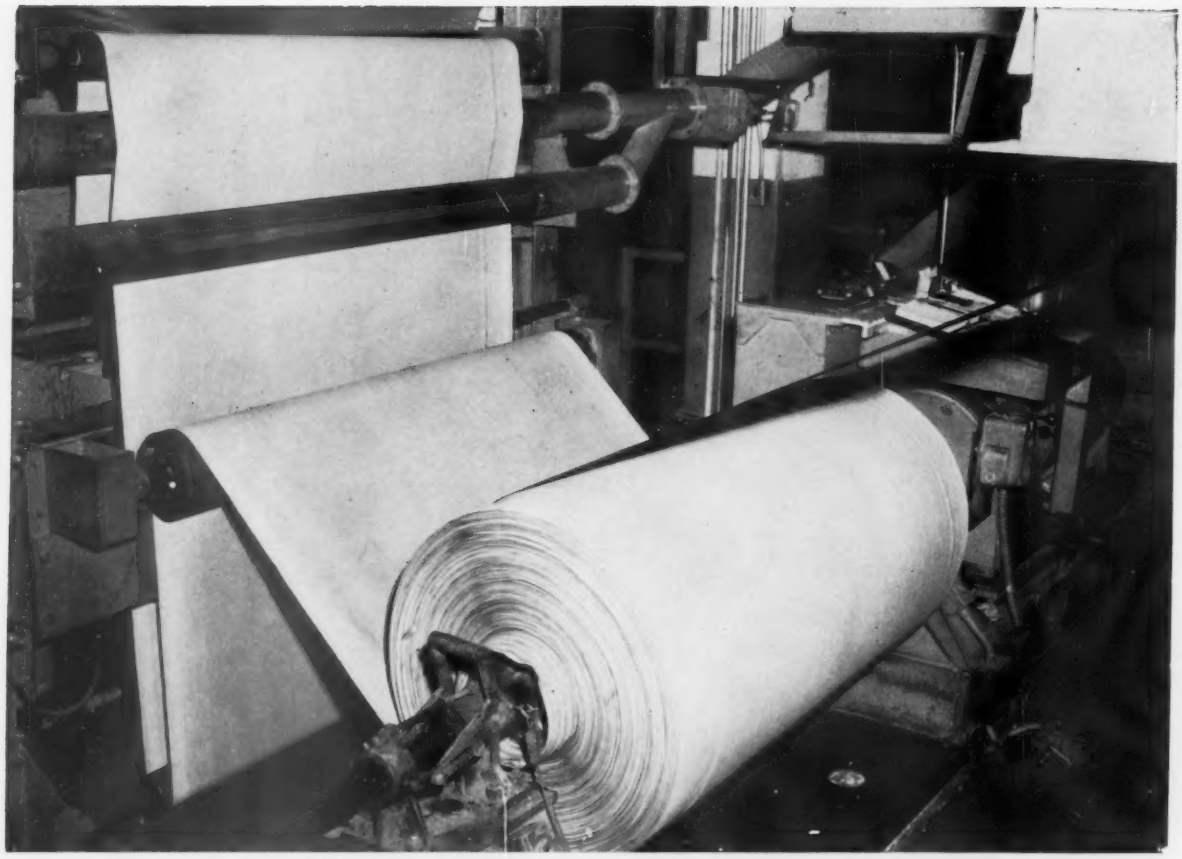

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means uniformity in cold rubber...

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try starting with COPO's UNIFORM COLD RUBBER.

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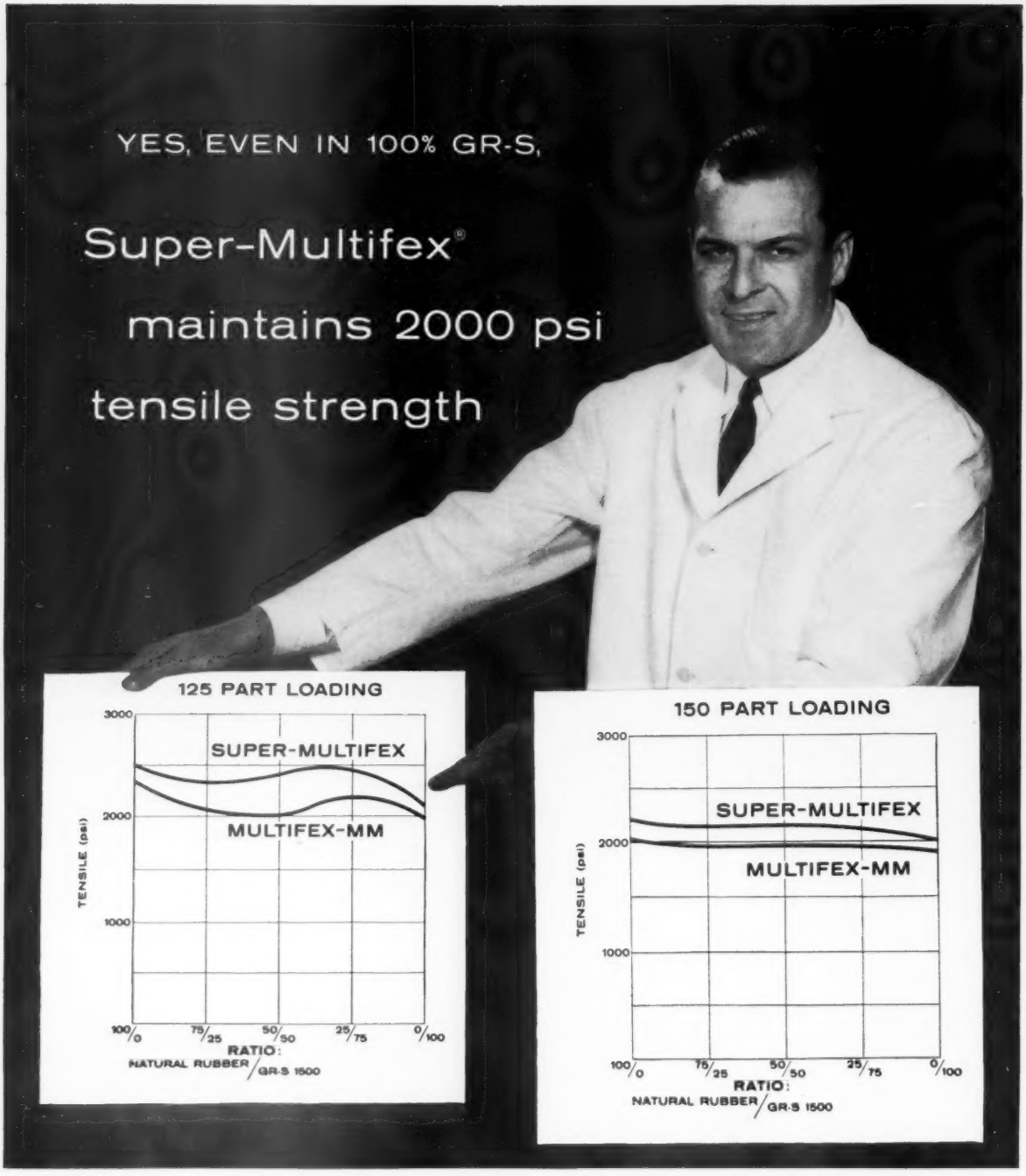
YES, EVEN IN 100% GR-S,

Super-Multifex® maintains 2000 psi tensile strength



Now you can use DIAMOND Super-Multifex in your GR-S compounds—even in those with *no* natural rubber—and be sure you're getting at least 2000 psi tensile strength.

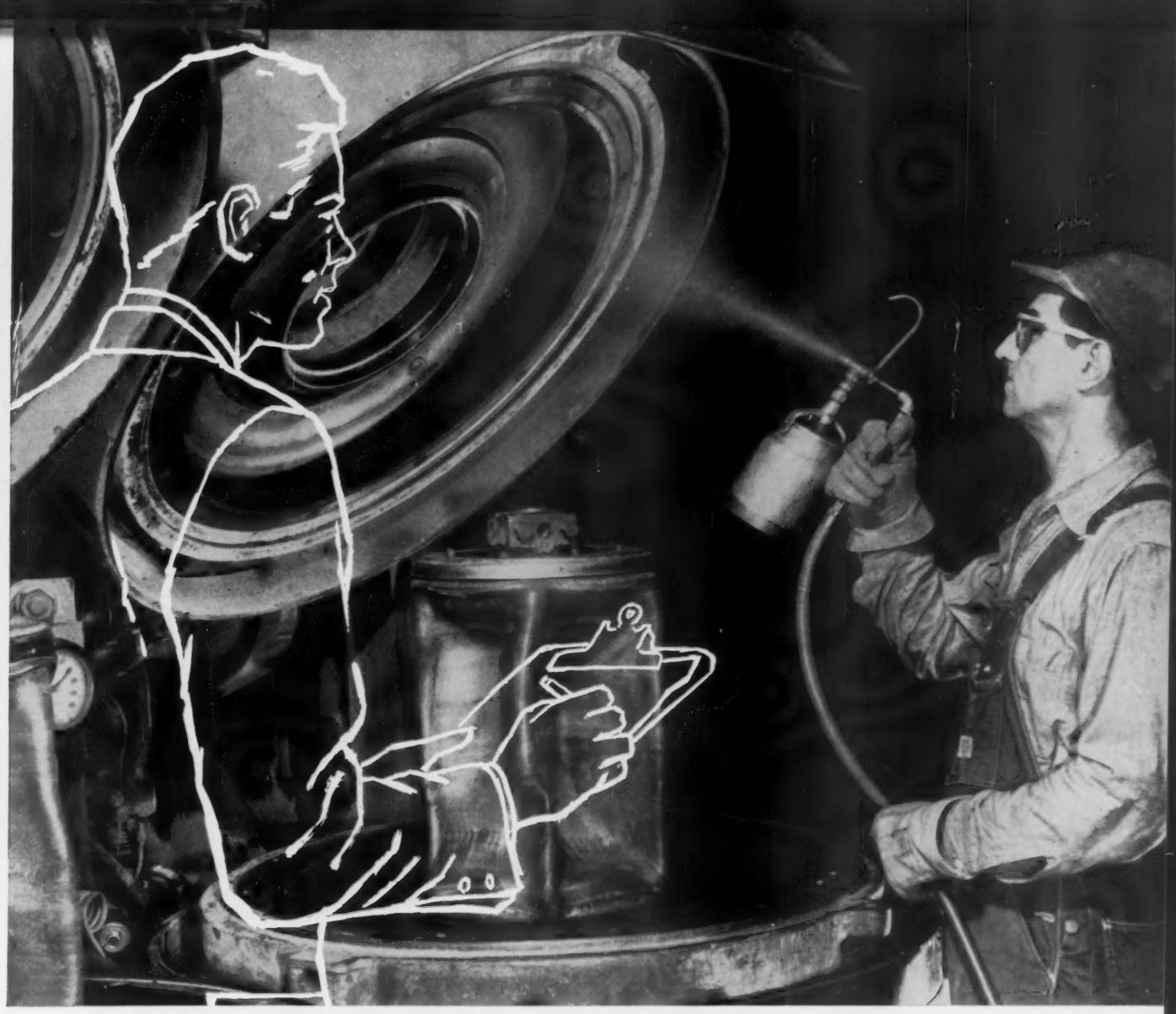
Contrast the performance of Super-Multifex and Multifex-MM® with the much lower tensiles normally obtained in compounds containing ground limestone.

DIAMOND's ultra-fine Super-Multifex (.03 micron) precipitated calcium carbonate has extremely uniform particles, coated to aid dispersion, mixing and processing.

Multifex-MM, also shown on the graphs, is an uncoated, ultra-fine (.04-.06 micron) precipitated calcium carbonate. You can see how it consistently reinforces GR-S, too.

Try either Super-Multifex or Multifex-MM in your next batch to improve physical properties. Call your DIAMOND Representative today. He can supply information and technical help on these and other high-grade calcium carbonates. Or write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, Ohio.

Diamond Chemicals



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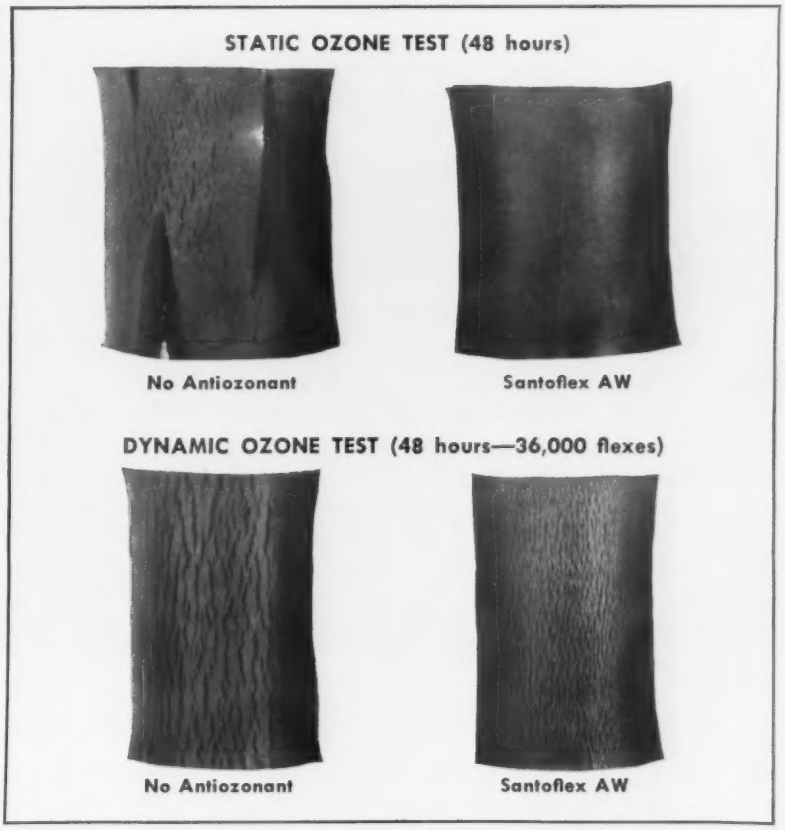

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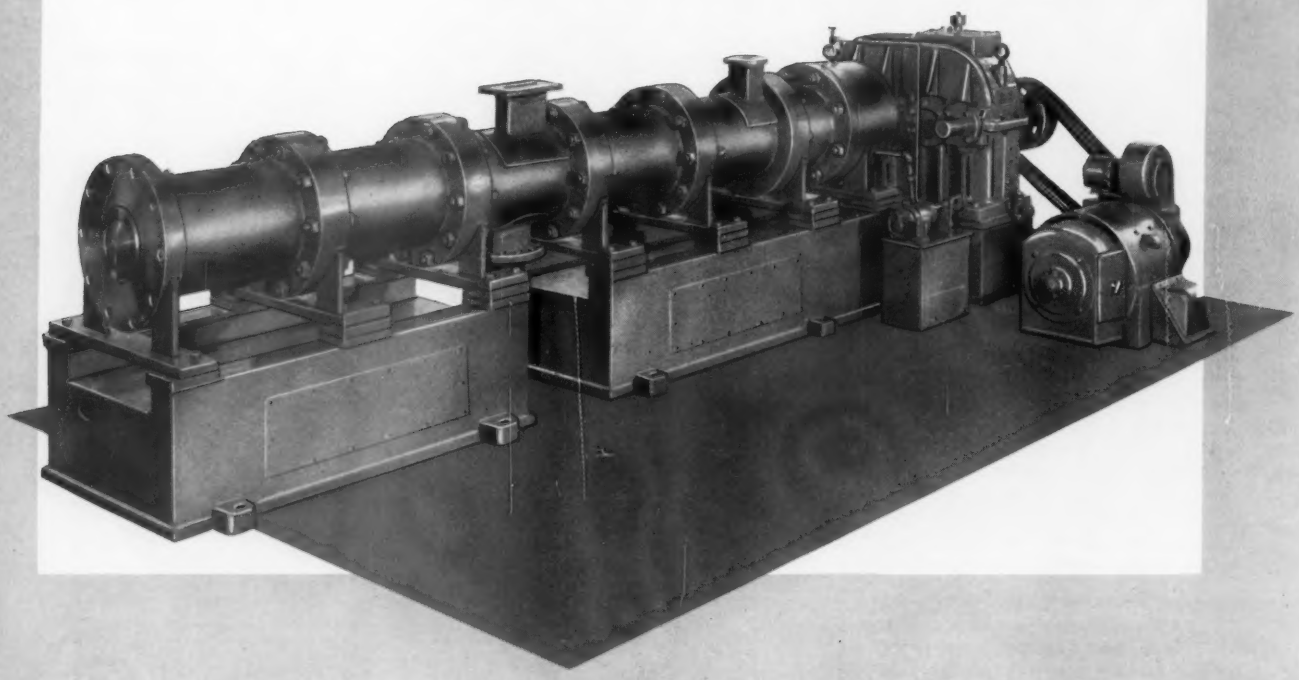

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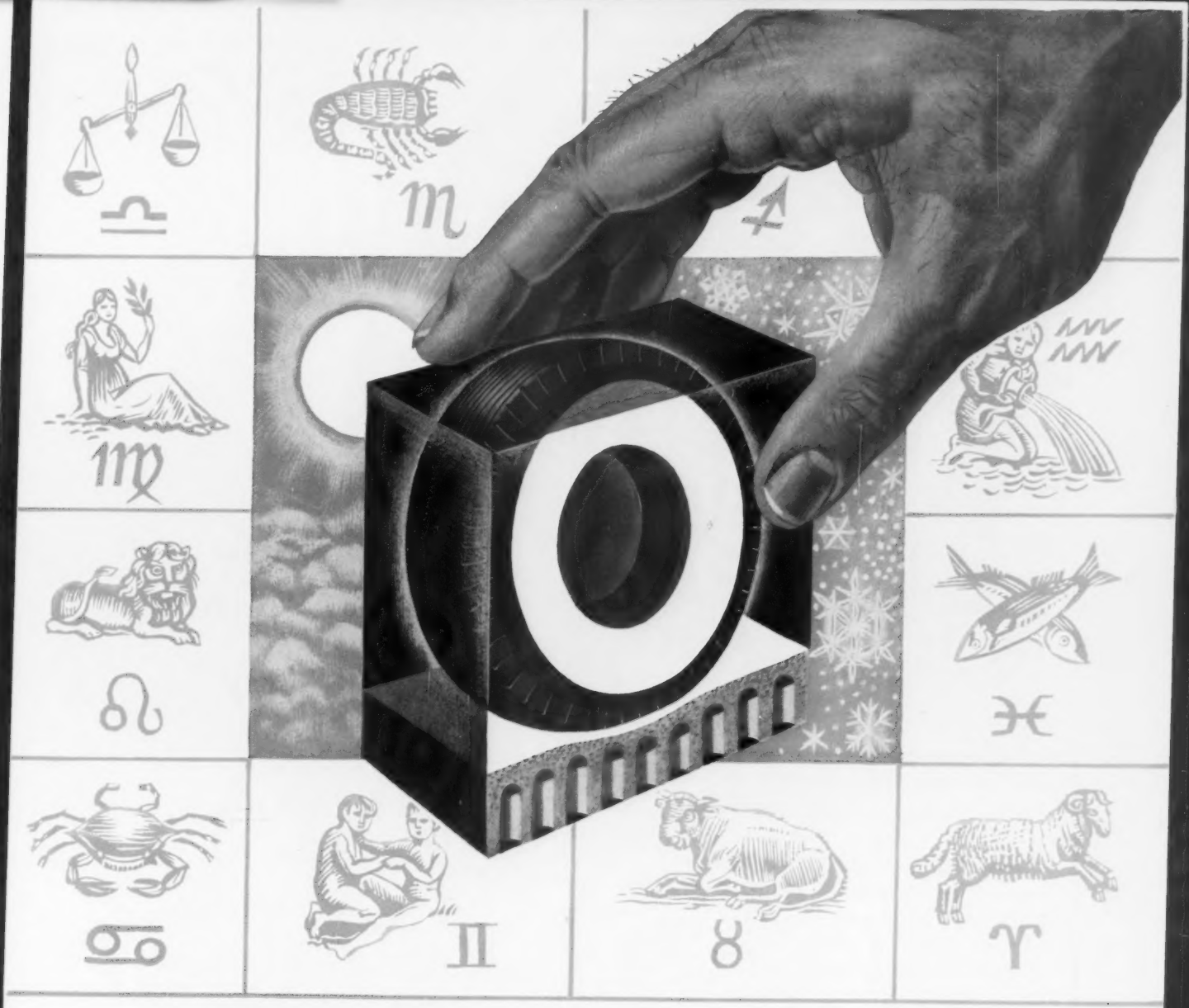

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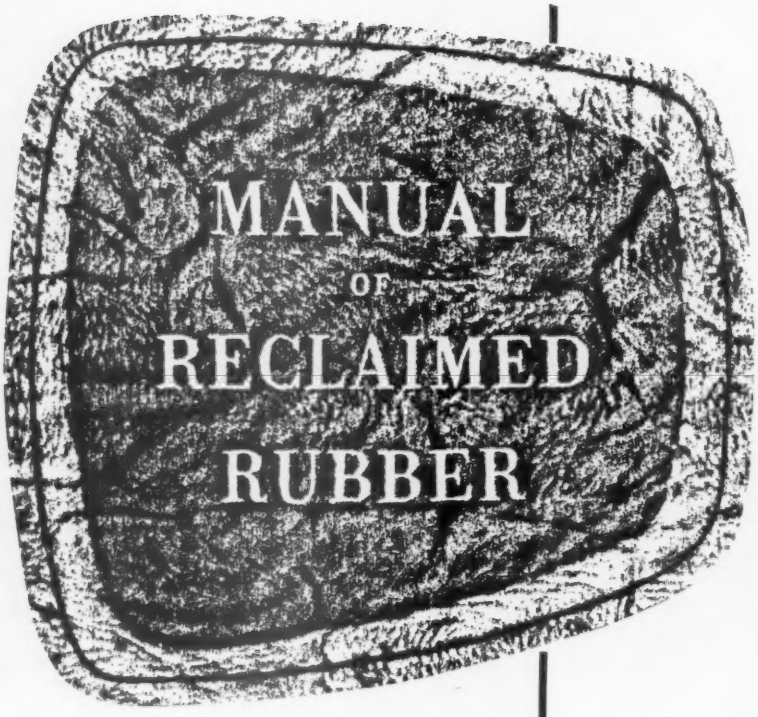

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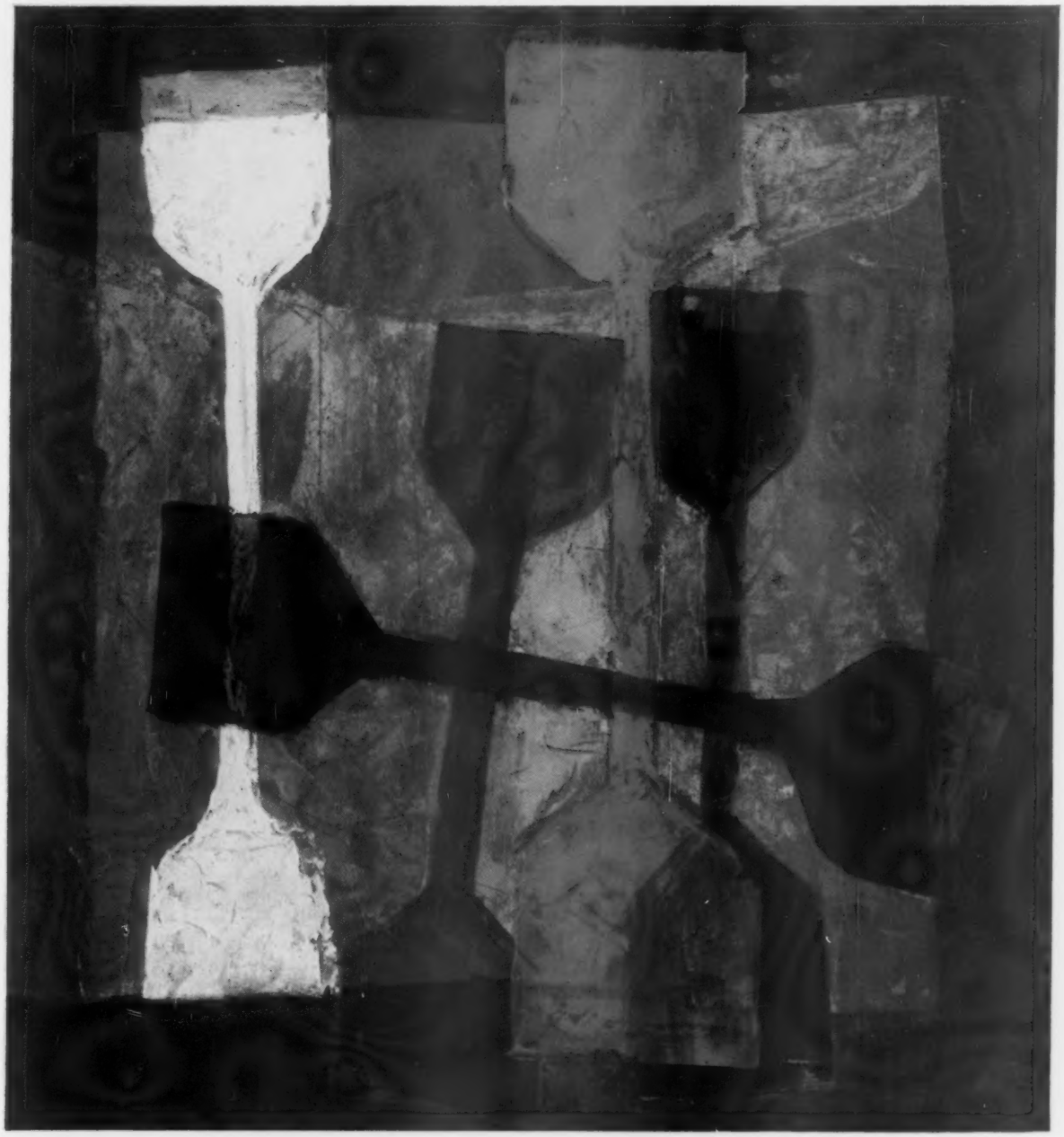

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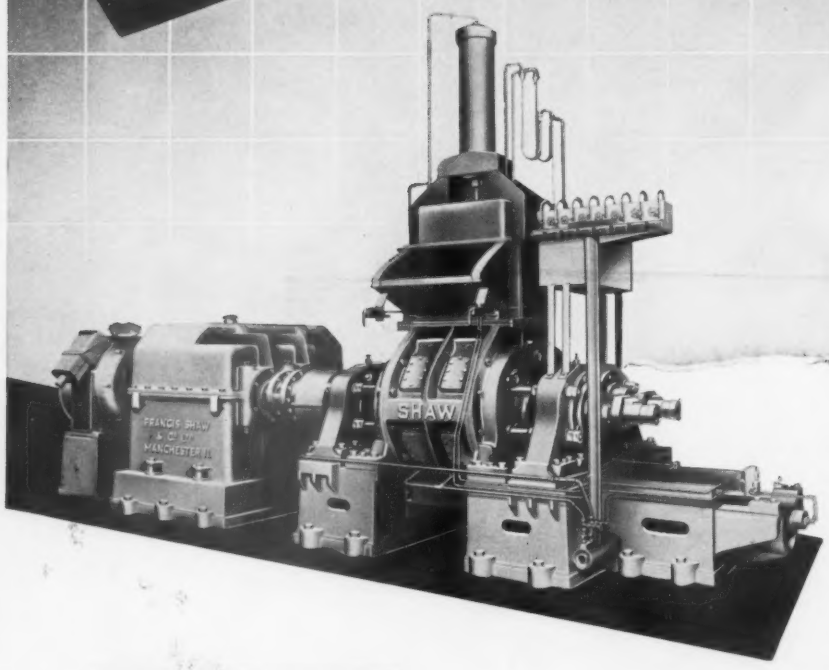

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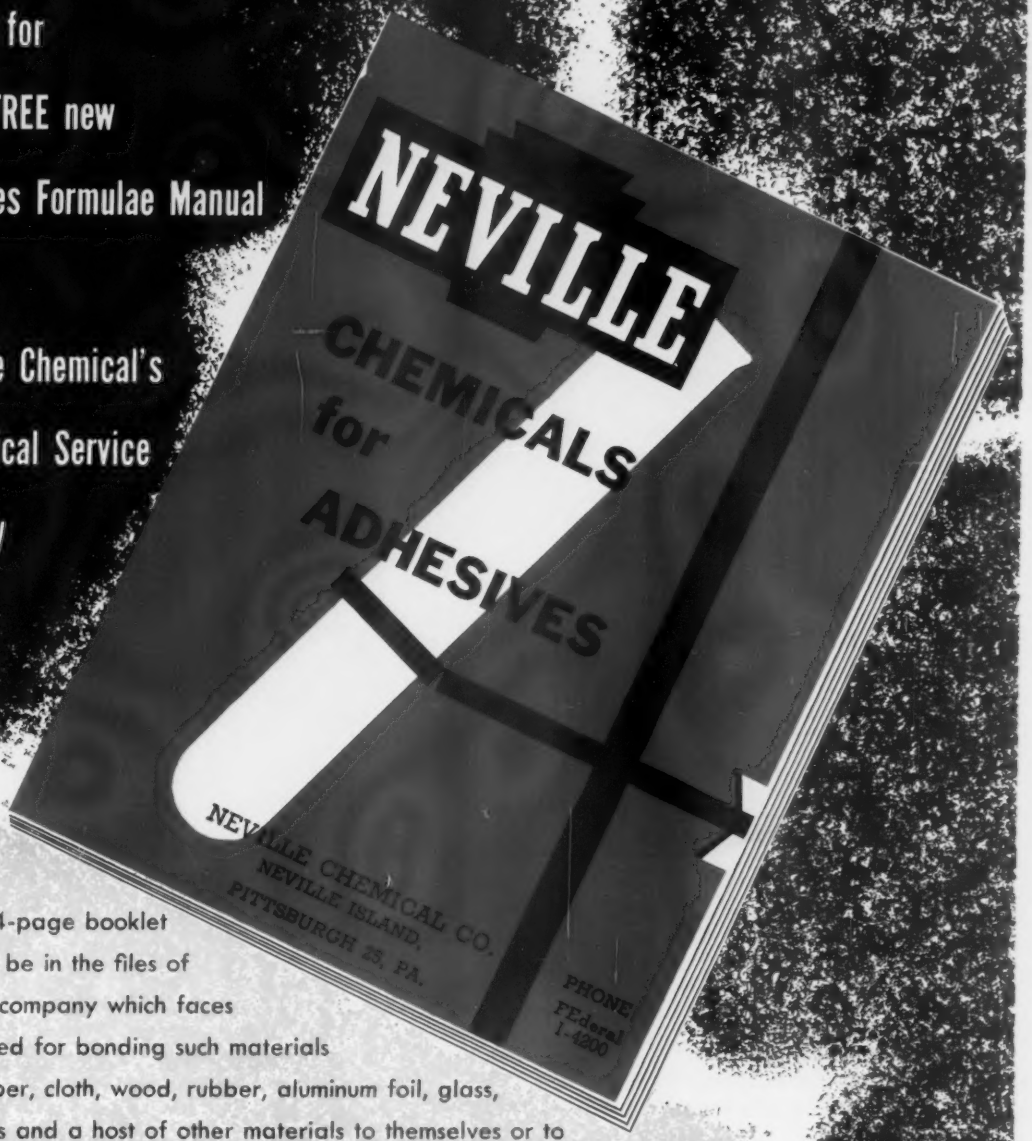

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Rubber Age

Vol. 82, No. 3 December, 1957

By ROBERT HARRINGTON
Hanford Laboratories Operation,
General Electric Co., Richland, Wash.

Elastomers for Use in Radiation Fields

Part II: Effect of Gamma Radiation on Heat-Resistant Elastomers

Data on physical property changes of silicone, fluoroelastomer and isocyanate-urethane elastomers

THE first article in this series provided general background information on the subject of radiation damage to organic polymers, outlined the method of measuring physical property changes, presented two sections concerning some basic considerations (post irradiation effects and effect of dose rate), and included data on the stress cracking of elastomers induced by gamma radiation *(1)*. This article presents data on the effects of gamma radiation on elastomers which have been arbitrarily classed as heat resistant. This designation includes those materials which can be used for service in air or certain fluids at 125°C. or higher for prolonged periods without being adversely affected. They were selected both from the manufacturers' technical literature and a series of screening tests *(2)*. There are other materials which could fall into this category, but for convenience in classifying and grouping, these materials (e.g., some formulations of acrylic and chlorosulfonated polyethylene elastomers) will be treated in future articles.

Materials Evaluated and Experimental Procedure

The materials used for the gamma irradiation studies reported herein are listed in Table I. They are grouped in accordance with the general chemical type of the base polymer used in each material, and where possible, a brief description is given.

The materials which are not proprietary items are described more completely in Table II, which gives recipes and cure schedules. The information given here is of prime interest in that it offers an opportunity to assess the role of the various compounding materials on the base polymer. In the case of proprietary materials this information can be obtained, although not nearly as comprehensively, by observing the efforts of varying factors such as filler loading, cure system, and post curing schedules on the radiation induced changes occuring in the materials. This is exemplified by the studies carried out with Union Carbide's K-1040 series and to a lesser extent with General Electric's 300 series silicone elastomers. Excellent work in the field of studying the effects of radiation on compounding materials is being carried out currently by Born *(3)*.

The studies reported herein were designed to provide information on the room temperature radiation resistance of the elastomers both for screening purposes and for future use when the irradiations will be carried out at elevated temperatures. All materials were exposed to gamma radiation and evaluated by recording changes in physical properties as described previously *(1)*. For all irradiations up to and including 1×10^8 r a Cobalt-60 isotope source at Hanford was used. For the higher

TABLE I—HEAT-RESISTANT ELASTOMERS USED FOR GAMMA IRRADIATION STUDIES

Material Supplier and Designation	Type or Description and Post Cure (hours/°F.)
SILICONES	
Dow Corning Corp.	
Silastic 152*	Dimethyl (24/480)
Silastic 181	Dimethyl (4/480)
Silastic 7-170	Dimethyl (24/480)
Silastic 160	Dimethyl (4/480)
Silastic 50	Methyl vinyl (24/480)
Silastic 80	Methyl vinyl (24/480)
Silastic 250	Methyl phenyl (24/480)
Silastic 675	Methyl phenyl (24/480)
Silastic S2048	Methyl phenyl (4/480)
Silastic 916	Methyl phenyl vinyl (24/480)
Silastic LS-53	Fluorocarbon (16/300)
General Electric Co.	
SE-972	Dimethyl (16/480)
81625	Dimethyl (24/480)
SE-361	Methyl vinyl (24/480)
SE-371	Methyl vinyl (24/480)
SE-381	Methyl vinyl (24/480)
HW-B6*	Methyl vinyl (6/450)
SE-751	Methyl vinyl (24/480)
81686	Methyl vinyl (24/480)
SE-550	Methyl phenyl (1/300)
SE-551	Methyl phenyl (4/300)
81590	Methyl phenyl (4/300)
81504	Methyl phenyl (24/300)
SE-555	Methyl phenyl vinyl (3/400)
Union Carbide Corp.	
K-1044R	Methyl vinyl, X-1960 cure (24/480)**
K-1045R	Methyl vinyl, X-1960 cure (24/480)
K-1046R	Methyl vinyl, X-1960 cure (24/480)
K-1047R B-1	Methyl vinyl, BP cure (4/450)
K-1047R B-2	Methyl vinyl, DBP cure (24/480)
K-1047R B-3	Methyl vinyl, X-1960 cure (24/480)
K-1047R B-4	Methyl vinyl, DBP cure (no post cure)
K-1047R B-5	Methyl vinyl, DBP cure (6/480)
K-1047R B-6	Methyl vinyl, DBP cure (12/480)
K-1048R	Methyl vinyl, X-1960 cure (24/480)
K-1035	Methyl vinyl (24/480)
K-1025R	Methyl vinyl (24/480)
X-1516	Methyl vinyl (6/480)
K-1014	Methyl vinyl (24/480)
Y-1668	Methyl phenyl (24/480)
Connecticut Hard Rubber Co.	
Cohrlastic 700	Dimethyl
Cohrlastic 500	Methyl vinyl
Cohrlastic HT-665	Methyl phenyl vinyl
Cohrlastic HT-666	Methyl phenyl vinyl
Cohrlastic R-11568	Methyl phenyl vinyl
SILICONES (Cont'd.)	
Arrowhead Rubber Co.	
Arcosil 2184	Methyl vinyl
Parker Appliance Co.	
77-018	Dimethyl
Huntington Rubber Mills	
S-931	Molybdenum disulfide filled
DuPont Fabrics Division	
Fairprene SR-5570	Not known
FLUOROELASTOMERS	
Minnesota Mining and Mfg. Co.	
1F4	Polymer of 1,1-dihydroperfluorobutyl acrylate
Kel-F Elastomer	Copolymer of trifluorochloroethylene and vinylidene fluoride
DuPont Elastomer Chemicals Dept.	
Viton A-1*	Copolymer of vinylidene fluoride and hexafluoropropylene
Viton A-2*	"
Viton A-3*	"
Viton A-4*	"
Viton A-5*	"
Viton A-6*	"
Precision Rubber Products Corp.	
PR 1700-X7	Copolymer of vinylidene fluoride and hexafluoropropylene
ISOCYANATE-URETHANES	
DuPont Elastomer Chemicals Dept.	
Adiprene C-1*	Not known
Adiprene C-2*	Not known
Adiprene C-3*	Not known
Adiprene C-4*	Not known
Goodyear Tire and Rubber Co.	
Chemigum XSL	Not known
Precision Rubber Products Corp.	
PR 631-70	Not known
Greer Industries, Inc.	
Disogrin DSA 6865	Not known
Disogrin DSA 7560	Not known

* See Table II for complete details of recipe and cure schedule. **X-1960 cure, curing compound including di-tertiary butyl peroxide catalyst; BP cure, benzoyl peroxide catalyst; DBP cure, dichlorobenzoyl peroxide catalyst.

irradiations spent fuel elements of the Materials Testing Reactor (MTR) were used. This latter source was used for the higher doses because the higher dose rates obtainable at the MTR very significantly reduced the amount of irradiation time. The results obtained from the irradiation of the same material to the same dose from both sources are nearly enough alike that it can be assumed that the experimental results obtained are independent of the two sources *(1)*.

The data obtained from exposing the materials listed in Table I to various doses of gamma radiation in air at 25°C. at normal atmospheric pressure are presented in Tables III, IV and V. These tables shows physical property changes induced by exposure to gamma radiation as per cent decrease (minus sign) or per cent increase (no sign) of the original property values which are given opposite zero irradiation dose. Also shown opposite zero irradiation dose and under the "Remarks" column is the original color of each material. Significant color changes and other observations needing comment are also noted in this column opposite the particular radiation dose causing the phenomenon. A portion of the data tabulated in the tables has been previously published *(4, 5)*.

Effects of Radiation on the Elastomers

The data presented in Tables III, IV and V show how radiation affects the properties of the materials broadly classified as heat-resistant elastomers. In most cases short doses, and in some cases intermediate doses, do not affect the usefulness of the materials to any great extent, but on continued exposure all of the materials examined are more or less severely damaged depending upon their chemical composition. The data also compare the effects of ionizing radiation on different classes of materials as well as materials within a class. This will be discussed in more detail subsequently.

Additional information of the effects of ionizing radiation on materials and details on the mechanisms of radiation damage can be obtained from a great number of excellent articles in the literature. Typical examples of these articles and general review articles are cited for reference purposes *(6, 7, 8, 9, 10)*.

A study of the data in Tables III, IV and V shows that of the three general classes of materials examined—silicones, fluoroelastomers and isocyanate-urethanes—the latter materials exhibit a remarkable amount of stability against the damaging effects of ionizing radiation when compared with the other materials under consideration. The fluoroelastomers in general show the least resistance, while the silicones cover a broader range, some being superior to the fluoroelastomers and some being of the same order of magnitude in radiation resistance.

Graphic representations of how the above classes of materials are affected by gamma radiation are shown in the accompanying charts. As space limitations imposed by the large number of materials evaluated preclude a graph of each one, the illustrations are meant to show the changes in a material that is in general typical of its group. Adiprene C-1 is representative of the isocyanate-urethanes; SE-972 (dimethyl silicone), Silastic 80 (methyl vinyl silicone), and Y-1668 (methyl phenyl silicone) are in general typical of the major types of silicone rubbers; and PR 1700-X7 is typical of a new fluoroelastomer (Viton A), while 1F4 shows still another fluorine-containing material. It should be noted that this latter group of materials is not as chemically similar as, for example, are the silicones, and are considered as a class only because they are miscellaneous polymers containing fluorine and afford a convenient means of grouping.

Resistance of Isocyanate-Urethanes to Radiation

As was stated above, the isocyanate-urethane polymers are more radiation resistant than the other materials studied and appear capable of giving satisfactory service to the relatively large dose of 1×10^9 r, and in all probability to even higher doses. They are resistant to stress cracking as was discussed previously *(1)*, and retain a great amount of flexibility (passing the 180° bend test at 1×10^9 r) and physical toughness.

All of the isocyanate-urethane materials which were investigated exhibited a decrease in both tensile strength and the ultimate elongation with increasing radiation exposure. In general, they all became somewhat softer until doses of about 5×10^8 r were reached, at which time they became increasingly harder. This hardness phenomenon (softening followed by hardening) together with a decrease in tensile strength suggests that for doses out to approximately 5×10^8 r chain cleavage is the predominant mechanism causing the physical property changes. However, the leveling off of the tensile curve (in some cases an increase in tensile strength) and an increase in hardness suggest that cross-linking predominates after doses of 5×10^8 r.

With the exception of Adiprene C-4, which is less resistant to radiation damage than the other Adiprenes studied, the compounding ingredients appear to have little effect on radiation-induced changes in these materials. In the case of Adiprene C-4 it appears that the different cure system is responsible for rendering the material less resistant to radiation.

The fluoroelastomers studied represent three different types of polymers, as exemplified by Kel-F Elastomer, 1F4, and Viton A. Kel-F Elastomer, which shows the least stability to radiation, becomes quite soft and tacky at the lower doses, which suggests the material undergoes chain cleavage with a corresponding reduction in molecular weight. Previous work *(11, 12)* gives more details on the radiation induced cross-linking and chain cleavage mechanisms.

TABLE II—RECIPES OF HEAT-RESISTANT ELASTOMERS USED FOR GAMMA IRRADIATION STUDIES

SILICONE

Silastic 152 cured 5 minutes at 250°F., post cured 24 hours at 480°F. HW-B6 cured 10 minutes at 250°F., post cured 6 hours at 450°F.

Materials	Silastic 152	HW-B6
Silastic 401 gum	100.00	——
GE 81567 gum	——	100.0
Celite Superfloss	10.0	60.0
Iron Oxide	3.0	5.0
Dow Corning Silica	35.0	——
Luperco ASF	1.5	——
Cadox 56	——	1.0

VITON

All compounds cured 30 minutes at 275°F., post cured 24 hours at 400°F.

Materials	A-1	A-2	A-3	A-4	A-5	A-6
Viton A	100	100	100	100	100	100
Zinc Oxide	10	10	10	10	10	10
Dyphos	10	10	10	10	10	10
MT Carbon Black	18	—	—	—	—	—
HiSil LM-3	—	20	20	20	20	20
HMDA-Carbamate	1	2	—	3	2	2
Benzoyl Peroxide	—	—	2	—	—	—
Peroxide Regulator (RCD-2110)	—	—	2	—	—	—
Akroflex CD	—	—	—	—	5	—
UOP-288	—	—	—	—	—	5

ADIPRENE

Adiprene C-4 cured 45 minutes at 307°F.; all others 60 minutes at 287°F.

Materials	C-1	C-2	C-3	C-4
Adiprene C	100.0	100.0	100.0	100.0
HAF Black	30.0	50.0	25.0	30.0
Flexol TOF	15.0	15.0	——	——
Sulfur	1.5	1.5	0.75	——
MBTS	3.0	3.0	4.0	——
MBT	1.0	1.0	1.0	——
Sundex 53	——	——	0.5	——
RCD-2098	0.35	0.35	0.35	——
Celluflex TPP	——	——	——	10.0
DiCup 40C	——	——	——	2.5

TABLE III — EFFECT OF GAMMA RADIATION ON THE PROPERTIES OF HEAT-RESISTANT SILICONE ELASTOMERS

Materials	Dose ($r \times 10^6$)	Initial Properties and Percent Change: Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
Silastic 152	0	50	440	845	Red
	3	4.0	— 3.4	— 1.0	
	5	22.0	—38.6	10.5	
	10	32.0	—52.3	18.2	
	50	62.0	—86.4	11.1	a
	100	74.0	—90.9	— 0.4	a
	150	84.0	—97.7	— 7.7	a
Silastic 181	0	84	110	830	Cream-tan
	5	3.6	—20.0	8.0	b
	10	4.8	—47.3	16.9	c
	50	10.7	—68.2	41.9	a,d
	100	14.3	—72.7	60.6	a,e
Silastic 7-170	0	76	85	670	Cream
	5	5.3	—10.7	14.5	f
	10	6.6	—28.6	29.0	b
	50	15.8	—52.4	42.1	a,c
	100	22.4	—64.3	59.0	a,d
Silastic 160	0	67	245	540	White
	5	7.5	—30.3	—2.8	
	10	9.0	—46.7	0.0	
	50	26.9	—75.4	25.3	g
	100	38.8	—85.7	97.6	a,g
Silastic 50	0	68	255	735	White
	3	— 4.4	—13.0	15.5	
	6	1.5	—26.9	17.0	
	30	10.3	—54.5	36.3	h
	60	20.6	—78.3	5.9	i
	90	25.0	—82.2	—10.1	a,c
Silastic 80	0	80	205	690	White
	3	2.4	—12.6	13.9	
	6	1.8	—40.1	9.1	
	30	4.8	—56.3	24.2	
	60	9.5	—78.2	47.6	g
	90	11.9	—80.5	62.1	a,g
Silastic 250	0	55	295	885	Rust red
	5	9.1	—21.7	2.9	
	10	9.1	—30.3	0.6	
	50	30.9	—71.1	—23.8	
	100	50.9	—86.7	—45.5	a
Silastic 675	0	75	210	700	Red
	3	8.0	—15.1	10.4	
	6	9.3	—22.3	22.1	
	30	10.7	—66.0	32.1	
	60	20.0	—73.0	51.4	a
	90	22.7	—80.6	56.1	a
Silastic S2048	0	64	320	675	White
	3	— 1.6	—22.4	6.8	
	6	3.1	—42.5	10.1	
	30	12.5	—56.5	20.3	
	60	23.4	—73.6	29.4	h
	90	31.3	—76.7	43.1	a,j
Silastic 916	0	62	580	1505	Red
	5	1.6	—13.5	— 8.8	
	10	9.7	—24.7	— 9.4	
	50	30.7	—82.7	—38.3	
	100	41.9	—96.0	—63.2	a
Silastic LS-53	0	59	220	1405	Red
	5	3.4	—18.7	—34.9	
	10	3.4	—36.1	—51.8	
	50	15.3	—72.2	—82.3	
	100	23.7	—90.9	—84.5	a
SE-972	0	83	70	955	Brown-tan
	5	1.2	—14.3	— 5.7	
	10	3.6	—28.6	5.9	
	50	12.1	—67.1	20.5	a
	100	15.7	—85.7	68.9	a
GE-81625	0	60	90	915	Brown-tan
	5	8.3	3.3	6.1	
	10	21.7	—13.0	5.9	
	50	43.3	—65.2	19.5	a
	100	55.0	—78.3	12.4	a
SE-361	0	75	120	945	Red
	5	— 6.7	—13.9	— 1.6	
	10	— 4.0	—22.1	— 7.3	
	50	12.0	—54.9	19.7	
	100	20.0	—71.3	41.9	a
	150	24.0	—83.6	50.2	a
SE-371	0	78	90	1020	Red
	3	— 2.6	—13.0	— 7.4	
	6	— 2.6	—18.5	— 6.4	
	30	6.4	—34.8	25.2	a
	60	12.8	—54.4	22.5	a
	90	16.7	—67.4	54.9	a
SE-381	0	86	70	975	Red
	3	— 5.8	— 4.8	— 4.4	
	6	— 4.7	—11.8	2.3	
	30	1.2	—26.5	33.9	a
	60	3.5	—41.2	44.3	a
	90	8.1	—70.6	88.3	a
HW-B6	0	68	140	320	Red
	3	—14.7	— 9.4	— 5.4	
	6	—14.7	— 9.4	— 5.7	
	30	— 5.9	—38.4	20.4	
	50	10.3	—67.4	38.7	a
	100	19.2	—78.3	42.8	a
SE-751	0	60	205	670	Light tan
	3	5.0	—11.8	4.6	
	6	3.3	—21.6	7.8	
	30	18.3	—53.4	3.4	
	60	33.3	—66.2	4.5	a
	90	46.7	—79.9	—26.4	a
	100	50.0	—96.6	—58.1	a
GE-81686	0	66	240	715	White
	5	— 3.0	— 1.3	11.5	
	10	9.1	—35.7	19.2	
	50	31.8	—83.2	25.2	a
	100	42.4	—91.6	4.6	a
SE-550	0	63	210	660	Light tan
	3	0.0	— 4.3	7.6	
	6	3.2	—13.9	0.8	
	30	7.9	—44.9	— 6.1	
	60	19.0	—66.5	—13.3	k
	90	30.2	—79.0	— 6.8	a,l
SE-551	0	56	350	1215	White
	3	— 3.6	—10.0	2.6	
	6	5.4	—15.3	1.0	
	30	16.1	—52.9	— 9.9	
	60	35.7	—78.6	—24.4	g
	100	55.4	—90.0	—39.1	a,m
	150	62.5	—92.1	—41.2	a,m
GE-81590	0	58	285	1090	Light tan
	3	0.0	— 6.7	—10.8	n
	6	— 3.5	—12.0	—10.7	o
	30	3.4	—50.7	—31.2	p
	60	13.9	—64.1	—34.9	q
	90	31.0	—78.9	—40.7	a,q
SE-555	0	60	590	1590	Grey
	5	6.7	—24.1	— 7.1	
	10	16.7	—36.4	— 8.6	r
	50	35.0	—86.4	—41.3	r
	100	45.0	—91.5	—51.6	a,r
GE-81504	0	77	350	930	Slate grey
	5	— 1.3	— 7.1	—16.3	
	10	3.9	—38.6	—12.2	
	50	19.5	—92.9	—20.2	a,r
	100	23.4	—95.7	— 8.1	a,r

a = broke when bent 180°; b = medium grey; c = grey; d = darker grey; e = dark grey; f = light grey; g = slightly yellow-cream; h = slightly grey; i = light blue-grey; j = yellow-grey; k = slightly yellow; l = dark amber; m = yellow-cream; n = pale green; o = slightly darker green; p = darker green; q = dark green; r = grey-green; s = too brittle for testing; t = grey-tan.

TABLE III—EFFECT OF GAMMA RADIATION ON THE PROPERTIES OF HEAT-RESISTANT SILICONE ELASTOMERS (CONTINUED)

Materials	Dose ($r \times 10^6$)	Initial Properties and Percent Change: Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
K-1044R	0	56	360	1080	Red
	5	0.0	—16.4	— 0.6	
	10	7.1	—30.4	—15.7	
	50	33.9	—81.1	—46.7	
	100	51.8	—88.9	—42.5	a
K-1045R	0	60	310	930	Red
	5	5.0	—22.1	—10.2	
	10	13.3	—41.9	—17.8	
	50	36.7	—83.8	—20.5	
	100	46.7	—91.9	—17.8	a
K-1046R	0	65	290	855	Red
	5	6.2	—25.0	8.1	
	10	9.2	—35.8	1.3	
	50	30.8	—77.4	5.8	
	100	43.1	—89.6	21.3	a
K-1047R B-1	0	70	310	1010	Red
	5	12.9	—22.6	— 2.9	
	10	15.7	—36.7	3.7	
	50	28.6	—87.1	5.0	a
	100	37.1	—96.8	37.4	a
K-1047R B-2	0	66	285	820	Red
	5	1.5	—17.0	— 6.4	
	10	15.2	—47.0	4.4	
	50	36.4	—85.9	10.5	a
	100	42.4	—89.5	19.6	a
K-1047R B-3	0	76	230	885	Red
	5	2.6	—30.4	2.6	
	10	4.0	—41.3	8.2	
	50	18.4	—84.8	13.4	a
	100	26.3	—89.1	30.7	a
K-1047R B-4	0	54	620	1020	Red
	5	1.9	—13.2	4.2	
	10	28.3	—55.0	— 7.9	
	50	66.7	—93.6	— 5.8	a
	100	77.8	—97.3	17.9	a
K-1047R B-5	0	64	400	965	Red
	5	9.4	—33.9	0.7	
	10	18.8	—62.6	— 0.5	
	50	42.2	—92.5	— 0.7	a
	100	51.6	—96.3	18.8	a
K-1047R B-6	0	67	375	940	Red
	5	3.0	—24.9	0.9	
	10	13.4	—57.1	4.4	
	50	35.8	—92.5	8.4	a
	100	44.8	—97.3	24.3	a
K-1048R	0	79	215	875	Red
	5	7.6	—30.2	2.7	
	10	10.3	—39.5	— 1.3	
	50	17.7	—84.7	12.8	a
	100	22.8	—89.3	31.1	a
K-1035	0	55	240	740	Light tan
	3	0.0	—17.4	— 4.9	
	6	7.1	—29.8	— 6.8	
	30	16.1	—48.3	— 1.1	
	60	25.3	—71.1	1.0	a
	90	48.2	—77.3	—12.0	a
K-1025R	0	62	180	775	Red
	5	1.6	—14.4	0.6	
	10	9.7	—28.2	— 7.1	
	50	29.0	—80.7	—38.8	a
	100	40.3	—84.5	—43.4	a
X-1516	0	70	180	620	Black
	5	5.1	—17.6	9.4	
	10	10.0	—35.2	4.0	
	50	24.3	—75.3	13.3	a
	100	31.4	—90.4	20.2	a
K-1014	0	48	590	430	White
	5	— 2.1	—38.1	—13.5	
	10	10.4	—57.5	—13.0	
	50	54.2	—86.0	—24.0	a
	100	72.9	—95.3	—15.6	a
Y-1668	0	52	330	800	Grey
	5	— 3.9	— 6.6	— 0.8	
	10	13.5	—36.7	—10.3	
	50	42.3	—75.9	—13.3	
	100	59.6	—84.9	—31.6	a
Cohrlastic 700	0	65	210	440	Grey
	3	—16.4	—10.4	20.6	
	6	—12.3	—31.6	16.3	
	30	0.0	—55.2	25.1	
	60	15.4	—71.7	26.5	a
	90	26.2	—	—	a,s
Cohrlastic 500	0	80	170	300	Red
	3	—16.3	— 3.8	— 5.3	
	6	—15.0	—16.7	0.0	
	30	—10.0	—49.4	30.2	
	60	— 1.3	—73.2	33.2	a
	90	6.3	—75.0	100.0	a
Cohrlastic HT-665	0	55	725	1525	Grey
	3	6.2	—17.1	—19.8	
	6	12.7	—27.5	—27.6	
	10	20.0	—44.8	—40.9	
	40	41.8	—84.1	—49.3	
	50	49.1	—89.0	—50.0	
	67	50.9	—93.1	—55.6	
	100	60.0	—95.2	—40.9	a
Cohrlastic HT-666	0	63	560	1465	Grey
	3	1.6	— 8.6	— 16.6	
	6	1.6	— 17.6	— 21.7	
	10	7.9	— 29.2	— 31.0	
	40	27.0	— 81.2	— 46.2	
	50	34.9	— 86.6	— 51.2	
	67	34.9	— 90.1	— 54.1	
	100	41.3	— 92.8	— 57.9	
	300	57.1	—100.	— 59.6	a
Cohrlastic R-11568	0	24	370	310	Grey
	5	8.3	— 2.4	28.9	
	10	33.3	— 28.2	1.9	
	50	102.	— 72.9	— 14.1	
	100	175.	— 82.4	— 21.9	
	300	267.	— 98.4	— 34.1	a,t
	500	304.	—100.	—100.	a,t
Arcosil 2184	0	54	375	360	Red
	3	7.4	— 11.1	41.8	
	6	11.1	— 50.4	42.0	
	30	31.5	— 66.5	88.3	
	60	44.4	— 83.9	79.3	
	90	57.4	— 89.3	126.	a
Parker 77-018	0	78	375	985	Green
	3	— 5.0	0.0	— 16.6	
	6	— 2.6	— 7.8	— 10.5	
	30	2.0	— 29.8	— 10.0	
	60	11.5	— 80.5	— 13.5	a
	90	17.9	— 87.6	— 13.7	a
Huntington S-931	0	55	295	590	Dark grey
	10	23.6	— 52.5	— 12.9	
	50	49.1	— 86.4	— 5.8	a
	100	60.0	— 89.8	— 8.3	a
Fairprene SR-5570	0	62	420	1025	Grey
	3	6.5	— 31.0	5.5	
	6	9.7	— 33.3	6.1	
	30	25.8	— 65.5	— 0.4	
	60	40.3	— 90.5	— 29.1	a
	90	55.2	— 94.7	— 36.8	a

a = broke when bent 180°; b = medium grey; c = grey; d = darker grey; e = dark grey; f = light grey; g = slightly yellow-cream; h = slightly grey; i = light blue-grey; j = yellow-grey; k = slightly yellow; l = dark amber; m = yellow-cream; n = pale green; o = slightly darker green; p = darker green; q = dark green; r = grey green; s = too brittle for testing; t = grey-tan.

TABLE IV—EFFECTS OF GAMMA RADIATION ON THE PROPERTIES OF HEAT-RESISTANT FLUOROELASTOMERS

Materials	Dose ($r \times 10^6$)	Initial Properties and Percent Change: Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
3M 1F4	0	71	150	1200	Black
	5	5.6	6.7	9.7	
	10	15.5	— 33.3	2.1	
	59	23.9	— 76.7	— 44.9	
	100	28.2	— 86.7	— 33.8	a
Kel-F Elastomer	0	75	640	1100	White
	3	— 12.0	4.4	13.6	b
	6	— 6.7	— 10.4	27.4	c
	60	— 10.8	— 14.8	— 36.4	d
Viton A-1	0	55	350	2070	Black
	50	49.1	— 84.4	— 23.4	a
	100	60.0	— 84.3	— 24.3	a
Viton A-2	0	77	275	1980	Brown
	5	14.5	— 32.6	— 12.9	
	50	25.0	— 87.0	— 11.6	a
	100	29.0	— 87.0	22.2	a
Viton A-3	0	66	575	1800	Grey-tan
	50	34.9	— 91.3	4.5	a
	100	40.9	— 92.2	8.9	a
Viton A-4	0	88	180	2625	Brown
	5	11.4	— 55.6	— 22.2	
	50	12.5	— 90.0	— 12.6	a
	100	13.6	— 94.4	8.2	a
Viton A-5	0	77	160	1875	Brown
	5	18.2	— 21.9	1.7	
	10	—	—	—	
	50	24.7	— 84.4	9.9	a
	100	29.9	— 84.4	25.4	a
Viton A-6	0	80	130	2125	Brown
	5	13.8	— 28.5	— 2.2	
	50	22.5	— 80.8	— 5.5	a
	100	25.0	— 84.6	49.2	a
PR 1700-X7	0	75	250	1865	Black
	5	4.0	— 33.2	— 4.6	
	50	18.7	— 79.8	— 14.5	
	100	25.3	— 85.8	12.5	a

a = broke when bent 180°; b = slightly tacky; c = tackiness increased; d = flow-like marks on surface.

The Viton A material and 1F4 both appear about equal in their resistance to radiation and are similar in this respect to many of the silicones studied. Although a decrease in tensile strength occurs in both materials, the increase in hardness which is accompanied by an increase in stiffness suggests that these two materials are cross-linked by exposure to radiation. For dynamic applications requiring a degree of flexibility, these two materials probably should not be exposed to doses out to 1×10^8 r. For static applications they, in all probability, could be used out to higher doses. The remainder of the Viton A materials were quite similar in their radiation resistance, showing the same general trend as PR 1700-X7 but becoming quite hard and stiff at a lower exposure and failing the bend test at a dose of 5×10^7 r. All of the fluoroelastomers gave no evidence of radiation-induced stress cracking.

Limited supplies of all of the fluoroelastomers precluded a detailed study of their radiation resistance characteristics, and further studies will be necessary before the role of the compounding materials can be determined.

Results of Tests with Silicones

As can be seen from the tables the predominant portion of the studies being reported was concerned with the silicone elastomers. This is in large part due to the great variety of materials commercially available and the fact that they have been tried and proven materials of construction for several years. Because of the various types which were studied, they can best be discussed by further grouping in accordance with their chemical composition.

Dimethyl Silicones. These materials appear to be generally less resistant to radiation than the other silicone types. In general, exposure to radiation increases both the hardness and tensile strength of the dimethyl silicones while it decreases the elongation. With the exception of Silastic 160, they all failed the bend test at either 5 or 6×10^7 r while Silastic 160 broke after an exposure out to 1×10^8 r.

Methyl Vinyl Silicones. With the exception of elongation, which is reduced with increased exposure to radiation, there appears to be no definite pattern of behavior with the methyl vinyl silicones. The tensile strength in particular exhibits quite random behavior, which is probably due to the number of vinyl groups in the polymer and the manner in which they cause cross-linking of the polymer during the cure. The materials all increase in hardness with increased radiation exposure with the exception of a few which initially soften somewhat before becoming harder. All of these materials broke when subjected to the bend test after exposure to doses from 5×10^7 r to 1×10^8 r.

Methyl Phenyl Silicones. These materials show in general the best resistance to radiation of all the silicone types. Exceptions to this are GE 81504 and Silastic 675, which were quite hard and broke at doses of 5 and 6×10^7 r, respectively. The remainder of the materials retained their flexibility up to greater exposure, some out to 3×10^8 r. With the exception of Silastics 675 and S2048 the general trend of the tensile strength of these materials was a decrease with increasing radiation dose. All materials got progressively harder while their elongation was decreased.

Methyl Phenyl Vinyl Silicones. Only two materials in this class were evaluated and their behavior (increase in hardness and tensile strength and decrease in elongation) was very similar to the majority of the methyl phenyl types. Both Silastic 916 and SE-555 broke after an exposure of 1×10^8 r.

Silicones in General. In general, it appears that the radiation resistance of the silicone elastomers is due in large part to the type and amount of organic groups on the main silicone chain. The phenyl types are superior due to the presence of the aromatic ring which is able to absorb more radiation energy without disruption of the molecular structure. It appears logical to assume that the phenyl materials showing the best radiation resistance had a higher percentage of phenyl groups on the main chain structure. The dimethyl types were the least resistant to radiation while the methyl vinyl compounds were intermediate.

For materials which were compounded from the same silicone gum but showed a difference in radiation resistance only general conclusions can be drawn, as the recipes and cure systems are not known for these ma-

terials. It is assumed in these cases that the compounding materials and curing ingredients also play a major role in determining the extent of radiation induced changes on the physical properties of the silicone elastomers. For example, the dimethyl Silastic 160 material is presumably based upon the same type of silicone gum as are the other dimethyl Silastic compounds, but it exhibits better performance in a radiation field. It is therefore assumed that the compounding materials used in Silastic 160 had a significant effect on the radiation-induced changes occurring in this material.

In several instances it should be noted that overlapping in the silicone radiation resistance scale occurs. For example, methyl vinyl K-1046R exhibits better resistance than GE 81504 methyl phenyl type. All silicones appear to cross-link during radiation exposure as evidenced by the physical property changes. A few, such as Cohrlastic 500, show evidence that chain scission might be taking place at low exposures because they initially become somewhat softer before assuming the general trend of becoming harder. It is of interest to note that many of the silicones, particularly those with light original colors, changed color during exposure to a very marked degree. As far as can be determined to date, these color changes are permanent. This conclusion is based on about eighteen months of observation. In all the silicones examined there was no evidence of stress cracking.

Filler Loading and Post Cure

Studies were made to determine the effect of radiation on the properties of silicone elastomers very similar to one another except that their original properties were different because of either a variation in the amount of filler used or a variation in the length of post heat curing. Table VI lists the changes occurring in two series of materials with varying filler loading and varying post cures, respectively. The materials are compared after receiving a dose of 1×10^8 r. Actual property values are given in this table to provide a better means of comparison with the original values than is afforded by the per cent change method.

The filler loading studies offer a chance to examine the role the fillers play with respect to radiation-induced property changes. Although the recipes of the materials (K-1040 series shown in Table VI and SE-300 series not illustrated) are not known, it is known that the materials in each series differ essentially only in the amount of filler they contain—the lower the compound number in the series, the less filler and the softer the compound.

The data in Table VI show that in general the ultimate changes in all the properties of these materials is such that given sufficient radiation exposure they will eventually approach the same value for each property, although the percentage change will indicate this only indirectly. For example, the actual values of hardness, tensile strength, and ultimate elongation for K-1046R, K-1047R, and K-1048R are essentially the same at a radiation dose of 1×10^8 r, even though there were notable differences in their original properties. This holds true for the SE-361, SE-371, and SE-381 silicone rubbers.

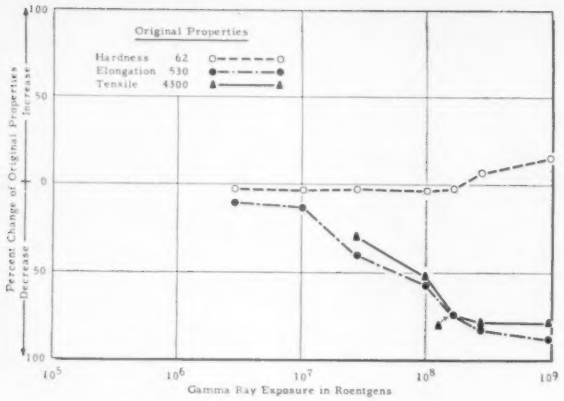
It should be noted that K-1044R and K-1045R follow the general trend in their series except that tensile strength was lowered but showed a possible tendency to increase if the radiation dose was increased. This phenomenon is in all probability due to greater unbalance of filler to polymer than is found in the harder members of the K-1040 series.

Of particular significance in these studies is the fact that a compound which becomes hard and brittle upon exposure to radiation cannot be improved simply by

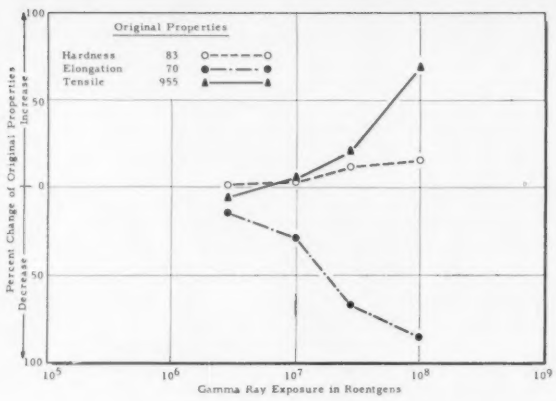
TABLE V — EFFECTS OF GAMMA RADIATION ON THE PROPERTIES OF HEAT-RESISTANT ISOCYANATE-URETHANE ELASTOMERS

Materials	Dose ($r \times 10^6$)	Initial Properties and Percent Change: Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
Adiprene C-1	0	62	530	4300	Black
	5	— 1.5	— 10.4	*	
	10	— 2.9	— 13.2	*	
	50	— 1.5	— 40.6	— 30.4	
	100	— 12.9	— 57.6	— 53.3	
	300	— 1.5	— 74.5	— 75.7	
	500	17.3	— 83.4	— 80.1	
	1000	15.9	— 87.7	— 80.4	
Adiprene C-2	0	75	360	3800	Black
	5	— 2.5	— 6.9	*	
	10	— 2.5	— 4.2	*	
	50	— 1.3	— 1.5	— 15.1	
	100	— 3.8	— 30.5	— 39.3	
	150	0.0	— 55.5	— 46.9	
	300	0.0	— 74.2	— 62.3	
	500	5.1	— 81.1	— 72.2	
	1000	11.4	— 84.7	— 67.9	a
Adiprene C-3	0	69	595	4400	Black
	5	1.4	3.2	*	
	10	1.4	— 6.0	*	
	50	— 6.0	— 17.8	— 37.5	
	100	— 7.2	— 30.4	— 50.4	
	150	— 6.0	— 48.0	— 58.4	
	300	— 1.5	— 67.3	— 66.4	
	500	1.5	— 81.5	— 75.9	
	1000	14.5	— 87.0	— 80.9	
Adiprene C-4	0	68	445	3445	Black
	100	27.9	— 83.2	— 59.1	b
Chemigum XSL	0	69	690	4000	Black
	6	— 2.9	0.0	— 5.9	
	10	— 9.0	— 12.1	— 25.2	
	50	— 17.4	— 31.9	— 68.0	
	100	— 20.3	— 58.0	— 79.5	b
	300	— 14.5	— 22.8	— 86.7	c
PR 631-70	0	77	540	3170	Black
	5	— 1.3	— 2.2	— 4.1	
	10	1.3	— 2.2	— 1.1	
	50	0.0	— 20.7	— 22.1	
	100	— 2.6	— 30.2	— 33.9	
	300	— 5.2	— 56.6	— 58.5	
	500	— 2.6	— 69.6	— 65.1	
Disogrin DSA 6865	0	77	700	6500	Tan
	5	1.3	2.6	*	
	10	— 1.3	5.0	*	
	50	0.0	— 44.3	— 52.5	d
	100	5.2	— 68.1	— 76.4	
	300	9.1	— 95.0	— 86.7	
	500	10.4	— 96.4	— 90.3	
	1000	20.8	— 95.7	— 89.9	
Disogrin DSA 7560	0	80	650	6000	Brown
	5	— 2.5	— 13.1	*	
	10	— 5.0	— 19.2	*	
	50	— 5.0	— 48.2	— 46.8	
	67	— 3.8	— 49.5	— 68.7	
	100	— 2.5	— 60.7	— 81.2	
	150	— 2.5	— 83.8	— 87.1	d
	300	2.5	— 92.3	— 91.6	d

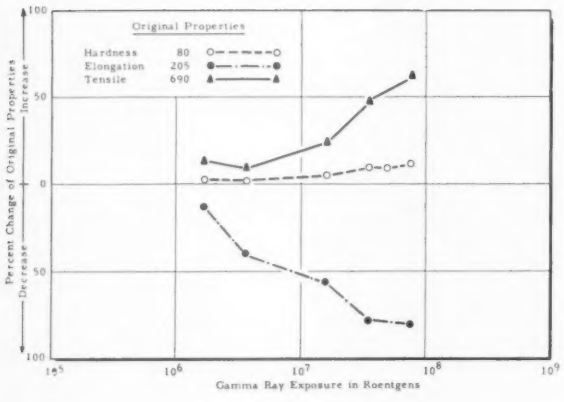
* Exceeded capacity of tensile tester (tensile strength greater than 4000 psi). a = broke when bent 180°; b = slightly tacky; c = soft and tacky; d = dark brown.



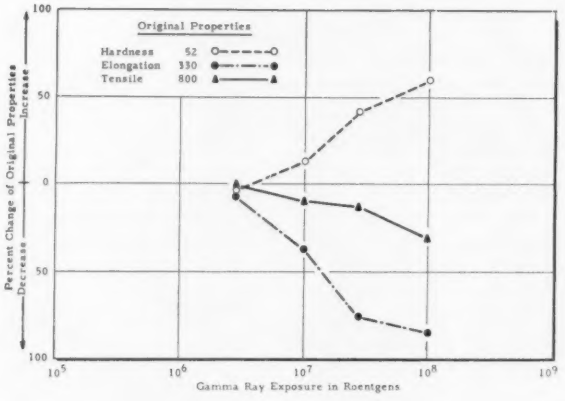
Adiprene C-1 Isocyanate-Urethane



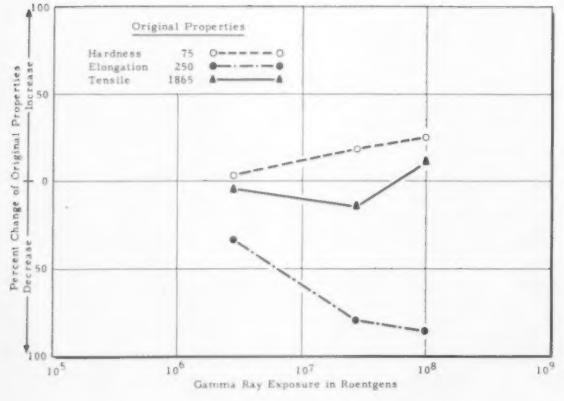
SE-972 Dimethyl Silicone



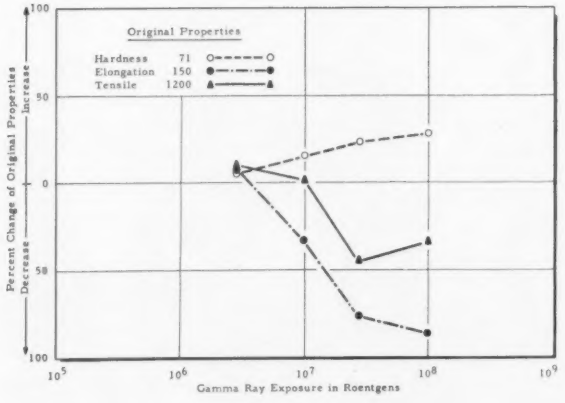
Silastic 80 Methyl Vinyl Silicone



Y-1668 Methyl Phenyl Silicone



PR 1700-X7 Fluoroelastomer



1F4 Fluoroelastomer

Changes in properties of elastomers induced by gamma radiation in air at 25°C. at normal pressure.

compounding to a softer material. This procedure might help compounds used in applications requiring a relatively low exposure, but at the higher doses all of the materials tend to approach the same degree of flexibility and hardness.

The post cure data shown in Table VI (refer to Table I for post cure schedules) also show that for similar materials with different post cures (therefore having different original properties) exposure to high doses of radiation will ultimately damage all of these materials so that their final properties will be essentially the same. In addition, these studies indicate that exposure to radiation offers the possibility of producing the desired post cure without the use of heat.

The following data show that the properties of K-1047R B-4 (no post cure) are very nearly the same as the original properties of the fully post cured K-1047R B-2 when exposed to a gamma radiation dose of 1×10^7 r:

	Properties		
Material	Hardness (Shore A)	Tensile (psi)	Elongation (%)
Original Properties of K-1047R B-2	66	820	285
Properties of K-1047R B-4 after 1×10^7 r	61	1010	390

The changes in the properties of K-1047R B-4 with increased radiation exposure, as shown in Tables III and VI, indicate that a slightly higher dose than 1×10^7 r would essentially give this material the same original properties as the conventional temperature post cured K-1O47R B-2.

For conventional applications excluding any radiation environment such a radiation treatment of a cured silicone elastomer would probably be quite satisfactory and would depend to a great extent upon the economics of radiation as opposed to heat treating. With respect to the material being post cured by radiation and then subjected to a radiation environment, it appears that further exposure would affect the material much in the manner as a material which had been heat post cured and then exposed to radiation.

Both materials broke and hardened significantly at a dose of 5×10^7 r. However, if it is assumed that the heat post cured K-1047R B-2 could have broken after a dose of 4×10^7 r, if the measurements had been made after this dose, and that the radiation post cured K-1047R B-4 would not have broken until a dose of 5×10^7 r was reached, then both materials would have (based mainly upon flexibility) an effective life of 4×10^7 r in a radiation field. It is also assumed that the K-1047R B-4 would have a 25% total longer life in a radiation field by virtue of its being originally softer, and would increase in hardness but not surpass K-1047R B-2 at the intermediate doses in question.

The cure system of the K-1047R series and its effect on the radiation-induced property changes can be examined by studying the data in Table III on the B-1, B-2, and B-3 materials. It should be noted that the B-1 material did not have a full heat post cure. Otherwise, especially on a comparative basis at an exposure of 1×10^8 r, the cure systems apparently do not exert a significant difference on the compounds.

The elongation of a material appears to be the most

TABLE VI—GAMMA RADIATION-INDUCED CHANGES IN SILICONE ELASTOMERS WITH VARYING FILLER LOADINGS AND POST CURES

	Original Properties			Properties After Exposure to 1×10^8 r		
Materials	Hardness (Shore A)	Tensile (psi)	Elongation (%)	Hardness (Shore A)	Tensile (psi)	Elongation (%)
FILLER LOADING SERIES						
K-1046R	65	855	290	93	1035	30
K-1047R B-3	76	880	230	96	1155	25
K-1048R	79	875	215	97	1150	25
POST CURE SERIES						
K-1047R B-4	54	1020	620	94	1085	40
K-1047R B-5	64	965	400	94	980	40
K-1047R B-6	67	940	375	94	1185	40
K-1047R B-2	66	820	285	94	985	55

sensitive single property measured in providing a good index of the damage induced by radiation. However, flexibility probably offers, for the longer exposures, a better means of determining the condition of a material. This is illustrated by comparing silicones K-1025R with GE 81590. At approximately 1×10^8 r the per cent property changes occurring in these two materials are essentially the same, yet the former material broke after an exposure of 5×10^7 r while the latter lasted about twice as long in the radiation field before breaking under the bend test. Both hardness and tensile strength measurements appear to be most useful only after a definite trend has been established. However, this is not always the case, as illustrated by such materials as Viton A-6 and GE 81598 where the tensile curve shows a fairly definite trend during low and intermediate doses and then abruptly rises or falls.

Actually, to best study the behavior of the physical properties of a material exposed to radiation, it is necessary to take all properties (the more the better) into account as well as both actual and per cent change of these properties. This is particularly true for applications which do not require that all property changes be held to a minimum. For example, a substantial loss in elongation will not affect the operation of some types of seals.

Summary

Physical property changes of a great number of materials classified as heat-resistant elastomers have been given. Each material, because of space limitations, could not be discussed completely, and the reader is urged to make his own comparisons or examinations of those materials in which he has an interest.

Of the three general classes of materials studied, the isocyanate-urethanes are considered to be the best with respect to radiation resistance, the silicones next, and the fluoroelastomers last. A consideration of other environments could obviously alter the order of this listing. It should be also noted that because of the overlapping of materials in one class with materials in another class, this order should be considered very general.

From the data presented it is difficult to assign permissible dose limits for classes of materials or even individual materials. This is due in part to the overlapping

of radiation resistance between classes and within a class, and in part to the fact that the demands of a particular application, such as the environmental requirements and the essential properties needed, must be known. Each material then must be considered on its own merits and intended application.

It has been shown that radiation might be utilized as a tool whereby silicone elastomers can be post cured without heat tempering. In this case the economics of the process would probably determine the practicability. Also, the color changes occurring in the silicone rubbers suggest the possibility of radiation dosimetry systems based on this color change.

ACKNOWLEDGEMENT

Acknowledgement is made to the various suppliers of materials for their cooperation in submitting test samples and pertinent materials information. It should be noted that many of the materials evaluated might never have been developed or intended by the manufacturers for the conditions to which they have been subjected. Any failure or poor performance of a material is not necessarily indicative of the utility of the material under less stringent conditions or for other applications.

Acknowledgement is also made to D. L. Hunke of the Phillips Petroleum Co., Idaho Falls, Idaho, operators of the Materials Testing Reactor for the A.E.C., and to S. W. Smith and F. M. Newby of the Hanford Atomic Products Operation, General Electric Co., for their assistance and cooperation in carrying out the irradiations.

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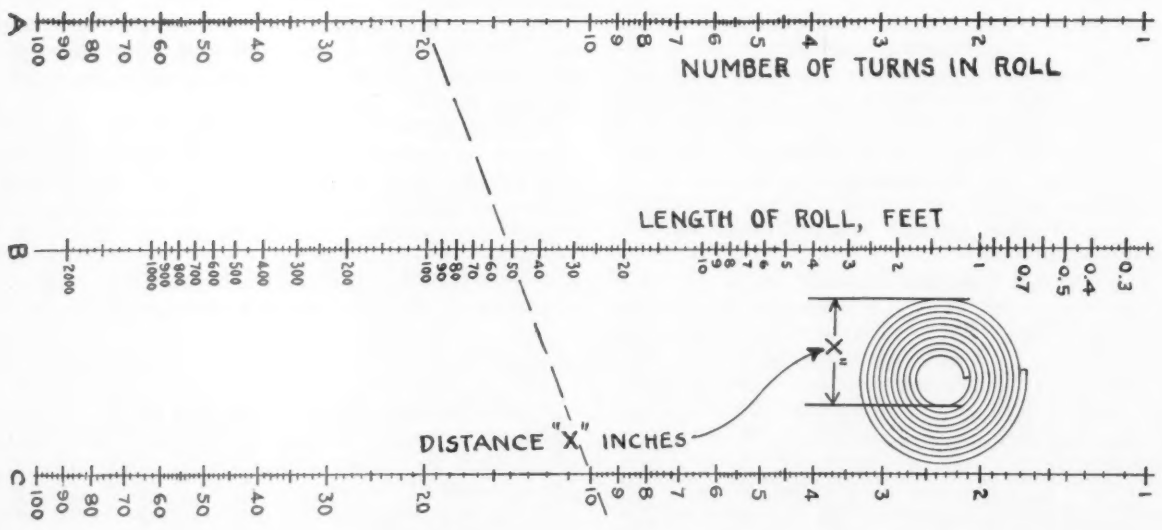
How to Find the Length of a Roll



USE the simple chart illustrated when you want to know the number of feet of material in any roll—belting, paper, insulation, wire netting, cloth, sheet metal, etc. It shows how to measure the roll. The distance X must be measured in inches, exactly as shown. Only one measurement is necessary, because this chart is based on a simple formula.

For example: How many feet of material are there in a roll which has 20 turns, the distance X being 10 inches? The dotted line drawn across the chart shows how easily the length is found. It is a little over 52 feet. Simply connect the 20 in column A with the 10 in column C and the answer is found at the point of intersection in column B.

It will be noted that the range of the chart is great enough to cover any ordinary roll. It is not necessary actually to draw a line as was done here. Just lay a straightedge across from known point to known point, and the intersection with the middle column gives the length of the roll immediately. A little practice will soon make you an expert in the application of this chart to actual problems. W.F.S.

Topography of Pressure-Sensitive Adhesive Films

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THE particular combination of qualities required for good adhesion is not well understood. It was suspected, however, that topography might be a contributory factor. Accordingly, the surface configuration of a variety of rosin-derived resin-rubber adhesive films which differed in chemical composition, in aging treatment, and correspondingly, in tack was studied by means of electron microscopy.

A correlation was observed between the surface irregularity of the films and their tack. Adhesive films with high tack showed a two-phase structure. Apparently the continuous phase consists of rubber saturated with resin, whereas the disperse phase consists of resin and low molecular weight rubber molecules. The disperse phase is present as more or less spherical particles, some of which are located at the surface, thereby giving it a pimpled character. Films having low tack, inherent or age-induced, have smooth surfaces.

A good adhesive must first deform sufficiently to contact the substrate intimately and then maintain that contact after it has been effected. In the two-phase systems studied, it is, presumably, the easily-deformed continuous phase, consisting largely of rubber, which makes it possible to bring the submicroscopic tack-bearing resin particles into close contact with the substrate.

THIS investigation was aimed at broadening our knowledge of the nature of adhesives and of adhesion. The particular combination of qualities required for good adhesion is not well understood. One might reasonably expect, however, that topography would be a contributory factor. Accordingly, we undertook to visualize by means of microscopy the surface configuration of a variety of resin-rubber adhesive films.

The films differed in their chemical composition, in the kind and extent of aging which they received, and, correspondingly, in tack. The samples used in this survey were the same as those used by Wetzel *(1)* in his analysis of pressure-sensitive adhesion, and his paper may be consulted for details of sample preparation, the method of tack measurement, and a discussion of those properties found to be important in the type of adhesion under study.

Experimental Procedure

Examination by techniques of light microscopy were found to be inadequate for observing the fine details of film topography, and so we turned to electron microscopy. For examination in the electron microscope, specimens cannot, among other things, be more than a few tenths of a micron thick. Because the resin-rubber pressure-sensitive films were too thick for direct use in that instrument, it was necessary to make and examine replicas of their surfaces.

Many replicating procedures have been described *(2)*. Most of them were inapplicable here because of such obviously unacceptable steps as (1) the use of pressure, (2) the development of heat, (3) the use of solvents which might attack the surfaces to be replicated, and (4) vacuum techniques, with the danger of altering the adhesive films themselves.

After some preliminary experimentation we adopted a procedure for making positive replicas from gelatin and nitrocellulose. The pressure-sensitive films were first coated with a warm ten per cent aqueous solution of

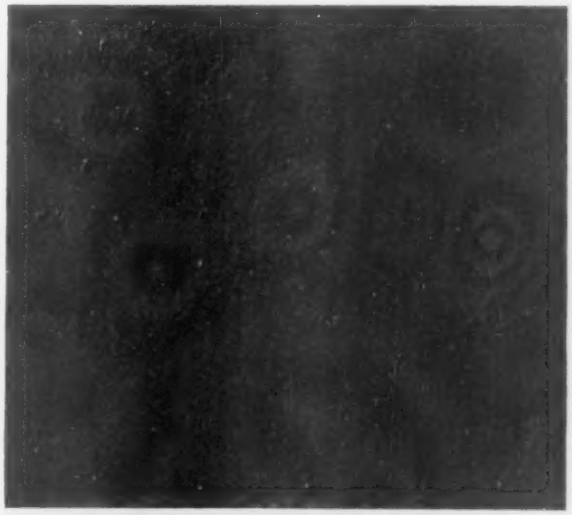


FIG. 1—Unaged film of natural rubber. (Magnification: X11,000; Tack Value: 200 to 300).

Note: This paper was presented before the American Chemical Society, Miami Beach, Florida, April, 1957.

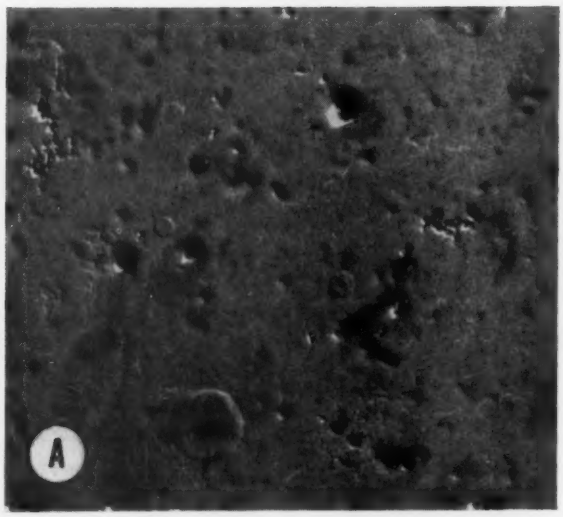
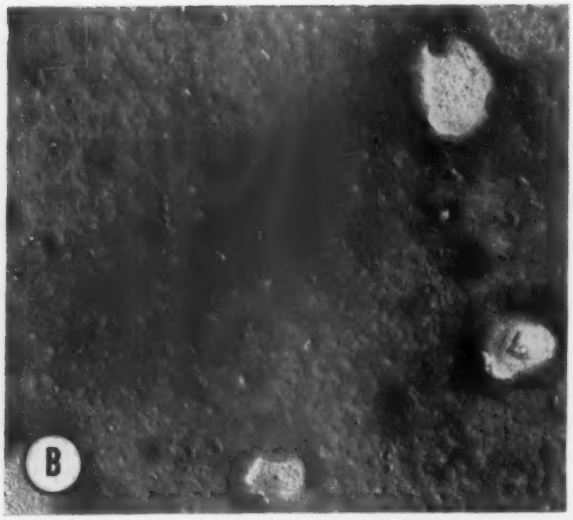
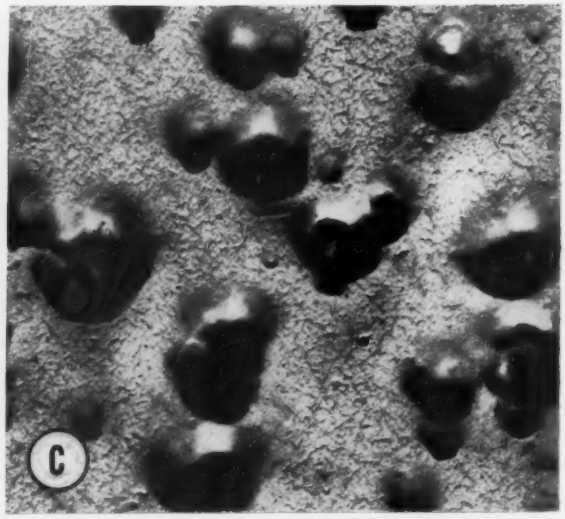
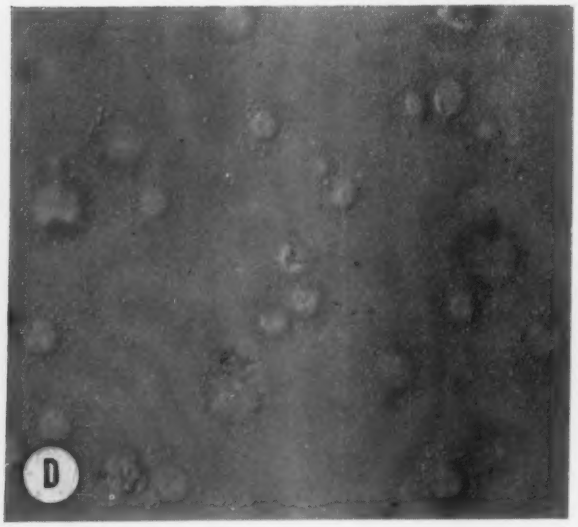


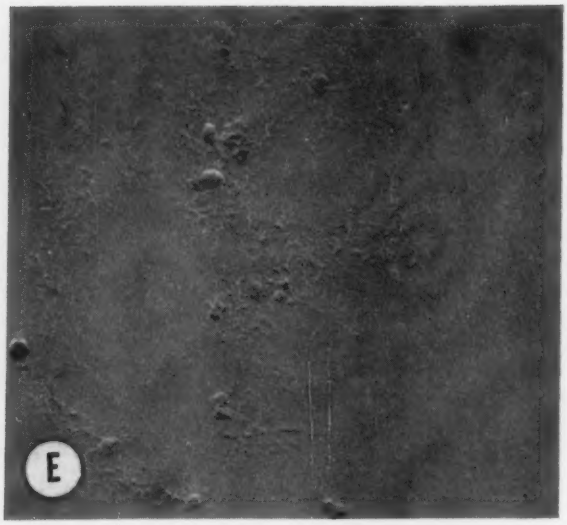
FIG. 2—Unaged films of Pentalyn H and rubber.

A—1:3 Ratio; Magnification: X11,000; Tack Value: 320. B—1:1 Ratio; Magnification: X9,000; Tack Value: 930. C—3:2 Ratio; Magnification: X11,000; Tack Value: 1200 to 1300. D—5:1 Ratio; Magnification: X11,000; Tack Value: 0. E—9:1 Ratio; Magnification: X11,000; Tack Value: 0.









gelatin. On drying, the gelatin formed a negative replica of the adhesive surface. The latter was then removed by dissolving it in toluene. The remaining negative replica of gelatin was washed in fresh toluene and flooded with a 0.5 per cent solution of nitrocellulose in amyl acetate.

After evaporation of the organic solvent, the gelatin was dissolved in warm water and the remaining positive nitrocellulose replica was shadowed with chromium vapor to increase contrast in the electron microscopical images. This replication procedure appears to be satisfactory. From the fact that during replication the adhesive films remain in contact with the aqueous gelatin for only a short time and also from the demonstrated insensitivity (tack values) of these films to high moisture for two weeks *(3)*, it seems unlikely that the structures observed in the final replicas are merely artifacts.

The adhesive films were made by a standard procedure wherein solutions of the resin and of the rubber in toluene were mixed to give the desired proportions. Using a doctor blade, 16-mil (wet) films were cast on glass and allowed to dry at room temperature for 10 to 20 hours until solvent-free. The rubber component consisted of pure natural unvulcanized rubber. The resins were Poly-pale Ester 10 (a glycerol ester of polymerized wood rosin), Staybelite Ester 10 (a glycerol ester of hydrogenated rosin), and Pentalyn H (a pentaerythritol ester of hydrogenated rosin).

Microscopic Examination of Films

Electron micrography of the surfaces of these various films demonstrated graphically how changes in tack are accompanied by changes in topography. From Wetzel's work on the tack of films cast from several combinations of resin and rubber *(1)* the following statements can be made:

(1) The tack of unvulcanized natural rubber films containing less than approximately one-third resin is low. As more resin is added tack increases, reaching a maximum at 50 to 75 per cent resin concentration. The addition of still more resin reduces tack.

(2) Aging, such as exposure to heat and to ultraviolet radiation, brings about a reduction in adhesion.

The smooth and uniform character of unaged films containing only rubber is illustrated by Figure 1. Such films have poor tack. How the surface configuration changes when Pentalyn H resin (an intermediate-softening resin) is added to the rubber is shown in Figure 2, where the concentration of resin in the five films is 25, 50, 60, 83, and 90 per cent, respectively.

Above a certain minimum concentration of resin the surface of the films becomes irregular. The addition of more resin brings about a still further increase in irregularity up to the range of maximum tack (50 to 70 per cent resin), beyond which surface irregularity decreases. These changes in surface character correlate nicely with measured values of tack.

Substantially the same situation prevails in films consisting of mixtures of Poly-pale Ester 10 (another intermediate-softening resin) and rubber, although the specific surface configuration is somewhat different. The differences in surface configuration depending on the concentration of this resin is pictured in Figure 3, where

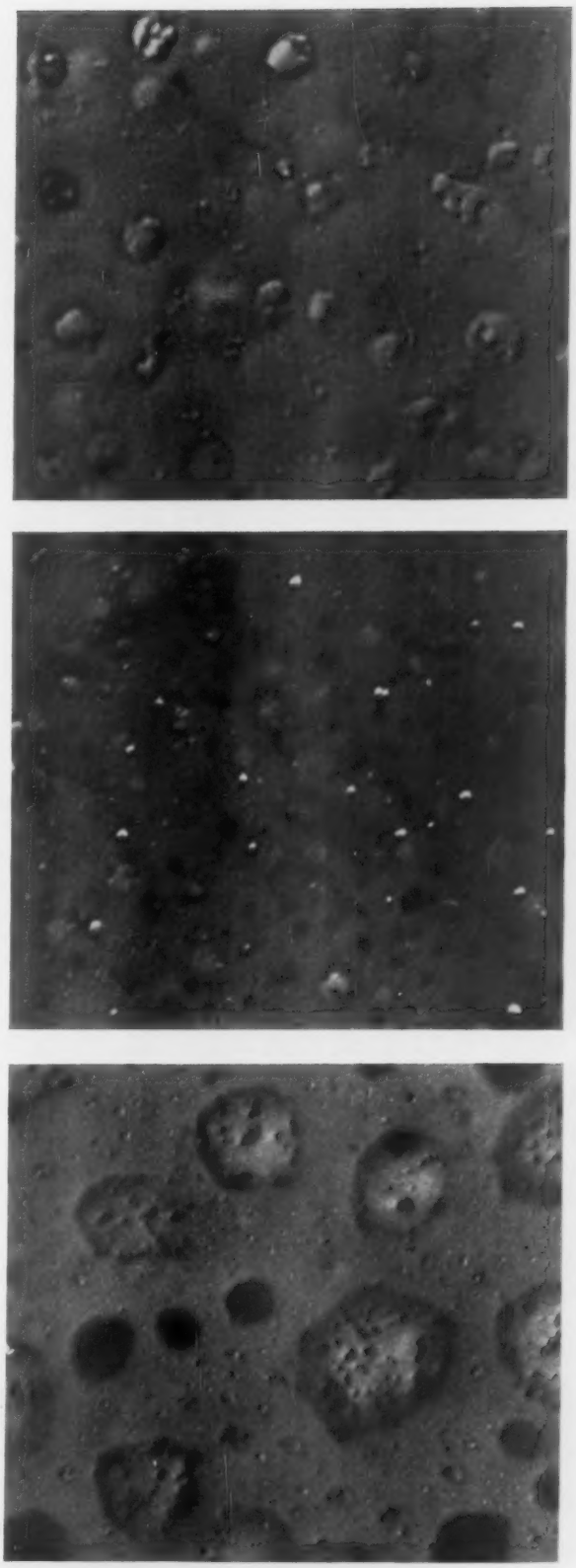


FIG. 3—Unaged films of Poly-pale Ester 10 and rubber. TOP—1:3 Ratio; Magnification: X9,000; Tack Value: 300. CENTER—1:1 Ratio; Magnification: X9,000; Tack Value: 500. BOTTOM—2:1 Ratio; Magnification: X9,000; Tack Value: 1320.

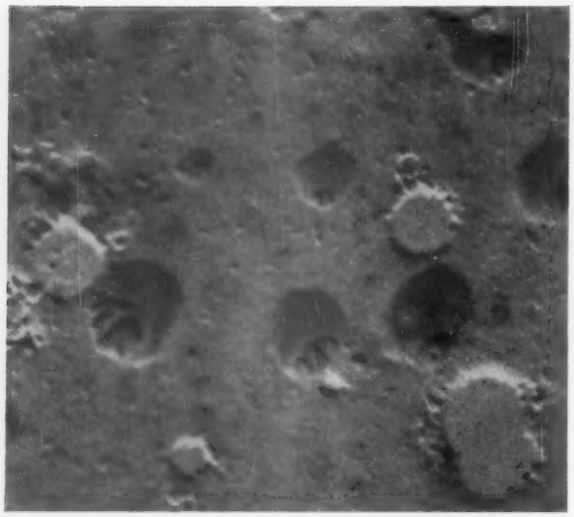


FIG. 4—Unaged film of Staybelite Ester 10 and rubber. (2:1 Ratio; Magnification: X9,000; Tack Value: 1250).

the concentration in the three films is 25, 50 and 67 per cent, respectively. Again, the addition of resin increases the surface irregularity of the films and this is accompanied by an improvement in tack.

Figure 4 shows the topography of a film consisting of 67 per cent Staybelite Ester 10 and 33 per cent rubber. With this resin—a low-softening one—as with the intermediate softening resins, the surface of films containing the resin and rubber in those proportions which give good tack is irregular. There are, of course, local topographical variations in any one type of film, but the electron micrographs selected for illustration can be considered typical.

Bearing in mind the surface configuration of the unaged films already described we can turn to their appearance after aging. Figure 5 shows the surfaces of a 3:2 Pentalyn H and rubber film after aging for 32 hours at 200°F. and after exposure for 1¼ hours to ultraviolet light. Figure 6 shows similar surfaces for films of 2:1 Staybelite Ester 10 and rubber.

Except for a small-scale roughness or granularity, the heat aged films have comparatively smooth surfaces, the highly pimpled character of the unaged parent samples having disappeared. It will be noted that both the heat aged and the ultraviolet aged films had tack values of zero.

Although the ultraviolet treatment destroyed much of the surface irregularity which characterized the parent films, the effect of the ultraviolet radiation was not so drastic as that brought about by heat. One reason for this may be that the deterioration caused by ultraviolet is confined mostly to the film surface whereas the heat affects the film as a whole.

Summary

These visual observations of film topography suggest that a two-phase system is necessary for obtaining pressure-sensitive adhesion from a two-component system. We have seen that rubber containing no resin or rubber containing resin in such concentration that its tack differs little from that of rubber alone shows only one phase and the film surfaces are smooth.

On the other hand, adhesive films having high tack show a two-phase structure. In these systems the continuous phase evidently consists of rubber saturated with resin while the disperse phase appears to consist of resin and low-molecular weight rubber molecules. The disperse phase is present as more or less spherical particles. Inasmuch as some of them are located at the film surface, this gives the surface a pimpled irregularity. The number of disperse particles and also their size (from several hundred to a few thousand Angstroms) vary in different systems, the number being greatest and size largest in systems having maximum tack. After maximum tack

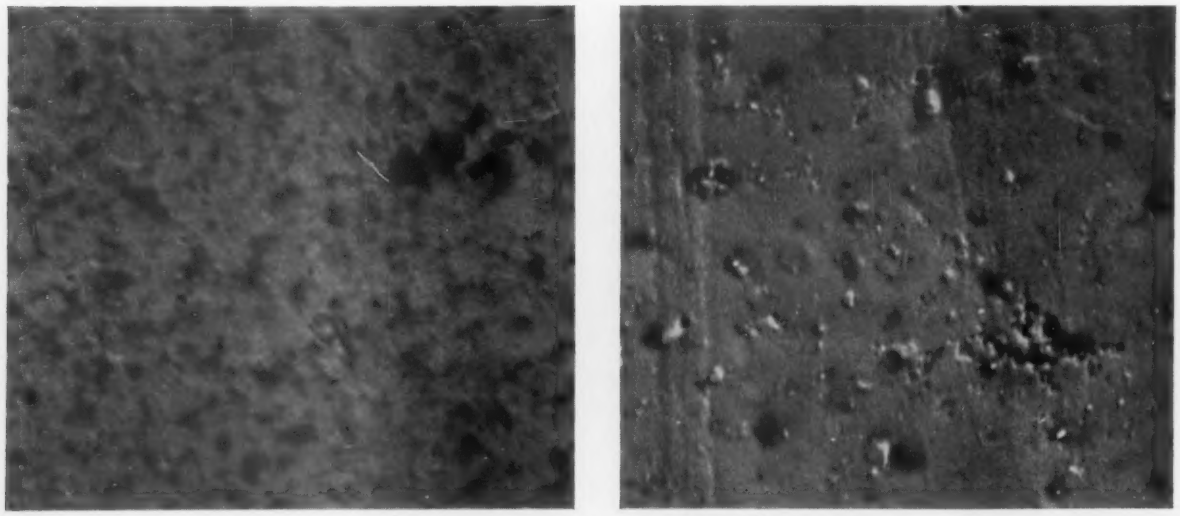


FIG. 5—Aged films of 3:2 Pentalyn H and rubber.
LEFT—Heat aged for 32 hours at 200°F. (Magnification: X11,000; Tack Value: 0). RIGHT—Ultraviolet aged for 1¼ hours (Magnification: X11,000; Tack Value: 0)

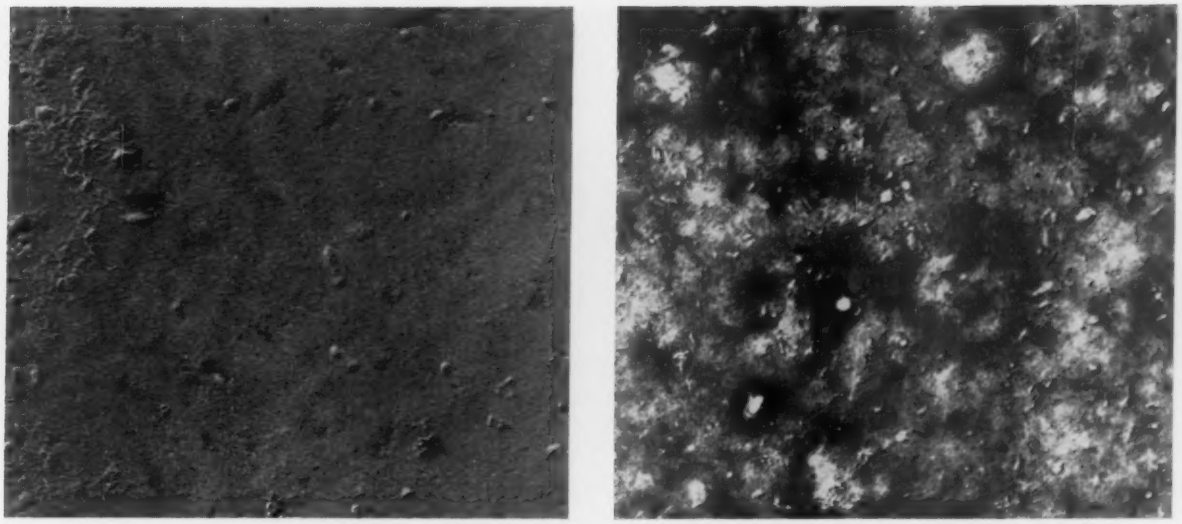


FIG. 6—Aged films of 2:1 Staybelite Ester 10 and rubber.

LEFT—Heat aged for 32 hours at 200°F. (Magnification: X9,000; Tack Value: 0). RIGHT—Ultraviolet aged for 1¼ hours (Magnification: X9000; Tack Value: 0).

has been obtained, the addition of more resin causes the resilient rubber to be replaced by the relatively harder resin. This reduction in film deformability is accompanied by a decrease in tack.

When two-phase films having good tack are aged, the films tend, depending on the severity of the treatment, to revert to one-phase systems. Presumably this is brought about by intrinsic changes in the two components. In films aged to zero tack, reductions of nearly 75 per cent in molecular weight of the rubber have been observed. A reduction of this magnitude probably makes the rubber and resin molecularly compatible and the conditions required for good tack no longer prevail.

Pressure-sensitive films with good tack and, correspondingly, good adhesion are those in which a dispersion of resin in rubber is maintained. Because a good adhesive must first deform sufficiently to contact the substrate intimately and then maintain that contact, what is the advantage of a two-phase system—with its pimpled surfaces—in helping to achieve this? Soft rubbery systems by themselves possess many of the requirements of a good adhesive but fail mainly because of their rapid elastic recovery. The pure resins, on the other hand, are not subject to bond failure for that reason, but because of their hardness and very high viscosity cannot make with the substrate the molecular contact which is necessary for good adhesion. In a two-phase system, however, the easily-deformed rubber can presumably bring the submicroscopic tack-bearing resin particles into close contact with the substrate.

LITERATURE REFERENCES

(1) Wetzel, F. H., "Function of Rosin and Rosin Derivatives in Pressure-Sensitive Adhesives," *Rubber Age*, Vol. 82, p. 291 (1957).

(2) Hall, C. E., "Introduction to Electron Microscopy," New York: McGraw-Hill (1953).

(3) Wetzel, F. H., unpublished data.

Gas Sterilizing Equipment

► Sterox-O-Matic gas sterilizing equipment, manufactured by Wilmot Castle Co., 1906 East Henrietta Road, Rochester, N. Y., is said to sterilize finished packaged materials as well as heat and moisture-sensitive products in a fraction of the time previously necessary. Contents of pre-sealed plastic, paper or cardboard containers, including rubber goods, adhesives and plastics, can be processed in any of several models available. Operation is automatic, and temperature, pressure and humidity can be closely controlled. Cycles are said to be exactly reproducible. A gas, Steroxcide 20, which is a combination of ethylene oxide and carbon dioxide, is the sterilizing medium. The equipment is available in cabinet or recessed models. Controls may be located at the sterilizer site or at a remote position.

Automatic Air-Hydraulic Converter

► Renco-Toledo, Inc., 3358 Alexis Road, Toledo 13, Ohio, has introduced an automatic air-convertor for use on curing presses and other hydraulic machines. The unit is entirely air operated with no electrical connections necessary. It incorporates a Renco-Aire micro-valve air motor and a hydraulic pump and reservoir in a single portable unit capable of continuous heavy-duty service at full output. The variable stroke pump is said to be instantly adaptable to any hydraulic requirement, with pressure maintained without by-pass or over-pressure action. The pump is designed to take up any loss in hydraulic line pressure automatically and silently. A single air connection controls hydraulic output. The unit is said to operate at air pressures as low as 5 psi minimum to 100 psi maximum.

Automatic Spray Painting

offers advantages in finishing of rubber-covered athletic balls

FIG. 1—An over-all view of the Binks automatic spray painting machine and dynaprecipitor booth. An endless conveyor belt carries the balls on spindles, which begin to revolve as they enter the spray booth.

A SPECIALLY-DESIGNED automatic spray painting system has reduced the cost of finishing rubber covered athletic balls approximately 40 per cent at the Chicopee, Mass. plant of A. G. Spalding & Bros., Inc. The principal components of the system are an automatic spindle spray painting machine and a dynaprecipitor water-wash spray booth (Figure 1), both products of the Binks Manufacturing Co., Chicago, Ill. Since the automatic painting facilities were installed in March, 1954, labor costs involved in the finishing operation have been reduced to less than half, and material costs cut 18 per cent according to Chester Kobak, Spalding's Rubber Department foreman.

The equipment is used to apply finish coats to the rubber coated footballs, basketballs, baseballs, volley and soccer balls made by the company. The finishing process entails the application of reddish-tan, brown or white paint, depending on the color specifications of the ball, or a coating of clear lacquer.

An important part of the spindle spray painting machine is an endless conveyor belt that carries the balls through the spray booth on large spindles. The balls are firmly positioned on the spindles by three-pronged "pin holders" devised jointly by Spalding and Binks. As the spindles enter the booth's spray area, they rotate rapidly, permitting the paint to be applied evenly by automatic spray guns.

The electrically-driven conveyor belt passes into and out of the spray booth through doors cut in its sides. Loading and removal of the balls is easily accomplished outside the booth as the conveyor revolves around.

In addition to the conveyor belt and water wash spray booth, equipment used in the finishing operation includes three model 21 Binks automatic spray guns (Figure 2), and Binks circulating pumps and portable pressure tanks. Air pressure is drawn from the factory's regular air-pressure tanks. Separate valves for all paint and air pressure lines permit the operator to maintain complete control of the spraying operation. The spray nozzles may be pre-set for automatic operation, or controlled manually for special applications (Figure 3).

Automatic Spraying Operation

The balls arrive in the finishing department by truck or dolly. Only one type of ball is sprayed at a time. The operation begins as a worker places the balls in the pin holders on top of the spindles as the conveyor moves past his loading station at the side of the booth. The three prongs of the pin holder grip the ball securely, but because of their small tip diameter, do not cover any appreciable area of the ball during the finishing operation.

As the conveyor belt moves into the spray booth, a guide wheel built onto each spindle engages a small belt mounted on the floor of the booth. This causes the spindle to revolve rapidly as it passes the automatic spray guns. As the rotating spindle approaches the area in front of the guns, a small dog engages a spray starting mechanism on the guns, setting them in action. After passing a set point near the other side of the booth, the dog disengages. This stops the spray and the ball passes out of the booth.

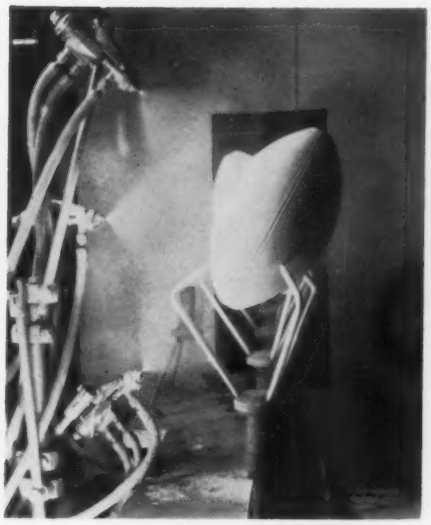


FIG. 2—Three automatic spray guns apply a uniformly even coat of paint over the surface of a football in just four seconds. These footballs move through the spray booth at the rate of 175 per hour.

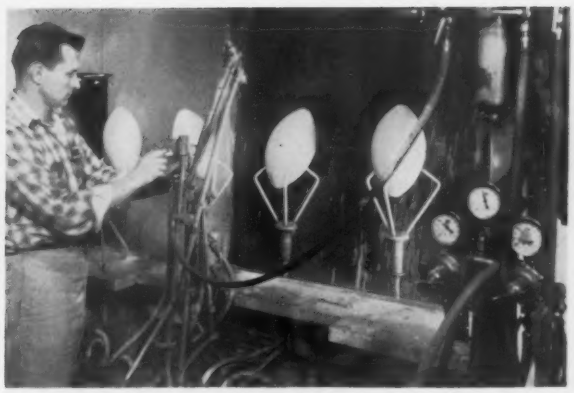


FIG. 3—Spray nozzles may be set for either manual or automatic operation. The curtain of water washing down the back of the booth removes paint overspray from the air, making a clean working environment.

The operator handling the spray painting machine can pre-set the spraying unit to utilize any amount of material pressure or to control the length of the actual spraying time. In the case of the white rubber footballs, the unit is set to spray each for a four second period at a pressure of 35 pounds per square inch. Similar settings are used for basketballs, baseballs, and other products finished on the line.

Quick Change of Paint Color

Use of the Binks portable pressure tanks permits the operator to convert from one paint color to another in a few seconds during the spraying operation. The quick-drying characteristic of the rubber-based paint used permits the balls to dry within seven minutes after they leave the spray area of the booth. After they are dry, the balls are removed from the conveyor by an operator stationed at the rear of the booth. They are then ready for stamping and packaging. From 150 to 250 balls an hour can be finished with the automatic equipment.

Previous to the installation of the Binks automatic spray equipment and water wash booth, Spalding rubber-covered balls were finished by hand spraying methods. In addition to cutting labor and material costs, the redesigned system has resulted in improved working conditions by reducing operator fatigue and providing cleaner, fresher air. Quality has reached a new high due to consistently uniform finish coatings that are evenly distributed over the ball.

Removal of Paint from Atmosphere

The Binks Dynaprecipitor water-wash spray booth utilizes a combination of water wash and air whirl action to remove paint particles from the air and exhaust them to the outside atmosphere. A large fan at the rear of the booth draws the pigmented air through a continuous curtain of moving water. This water curtain scrubs the paint particles, washing them down into a collecting pan at the bottom of the booth. Any pigment entrapped in the air stream is thrown against the booth's walls by the centrifugal force of rapid changes in air direction. Water then flushes these particles down into the collecting pan.

The booth's water circulation forms a complete circuit which constantly flushes the entire system when the booth is in operation. A throttling valve provides swift adjustment of the water flow across the booth curtains.

The Binks Dynaprecipitor booth has made a big difference in improving working conditions for the operators according to Mr. Kobak, who says that it removes overspray so efficiently that shop air remains clean and fresh. The operators are able to work without respirator masks or goggles.

Representatives of the Binks company worked closely with Spalding in designing the automatic spray painting system. The result has been a spray painting set-up tailored to particular requirements. In addition to extensive man-hour savings and stepped-up finishing volume, the automatic spray painting facilities give a more efficient operation and extremely fine quality control.

Panelists at the symposium, from left to right: Ralph P. Schmuckal, J. Hugh Macey, Fred W. Gage, Howard H. Irvin, Peter J. Larsen and Russell E. Sawyer.

Rubber-to-Metal Adhesion

A symposium held by the Akron Rubber Group

FEATURED at the October 25, 1957, meeting of the Akron Rubber Group was a five-man symposium covering the field of "Rubber-to-Metal Adhesion." J. Hugh Macey, Goodrich Research Center, Brecksville, Ohio, served as moderator of the discussion. The subjects and speakers were: *Challenge to the Rubber Industry,* Ralph P. Schmuckal, Ford Motor Co., Detroit, Mich.; *Trends in Metal Preparation,* F. W. Gage, Dayton Chemical Products Laboratories, Inc., West Alexandria, Ohio; *Adhesion Compounding Aspects,* Russell E. Sawyer, R. T. Vanderbilt Co., Inc., New York, N. Y.; *Adhesion Testing,* Peter J. Larsen, Lord Manufacturing Co., Erie, Penna., and *Trends in Rubber-to-Metal Bonding,* Howard H. Irvin, Marbon Chemical Division, Borg-Warner Corp., Gary, Ind. The papers presented by the panelists are reproduced in full herewith.

Challenge to the Rubber Industry

By RALPH P. SCHMUCKAL

Ford Motor Co., Detroit, Mich.

RUBBER is accepted today as a general engineering material. The fact that it can be bonded to metal is greatly responsible for its wide usage today in the automotive and related industries. But this didn't just happen. Sticking to metal is not an inherent property of rubber. A great deal of thought and theory and hit-and-miss experimentation went into the development of bonding materials and techniques to give us the state of the art, or science if you will, as we know it today. Much greater progress in this field has been achieved during the last ten years than during all time previous to this period.

When vulcanization of rubber was discovered, rubber adhesives also came about. But the development of bonding techniques did not keep pace with the developments of rubber itself. Therefore, the use of rubber as an engineering material was limited.

Before the advent of the chemical bonding systems in 1939, bonding methods consisted principally of the hard rubber technique, protein-latex systems, cyclized rubber-based adhesives, and brass-plating. Some of these are still in limited use today, particularly the brass plating method.

Although brass-plating may be considered one of the more successful bonding methods, it is no longer favored generally because of drawbacks as follows: (1) High cost of equipment required; (2) Necessity for extreme cleanliness of metal parts; (3) Sensitivity of adhesion to the composition of the brass deposited, and (4) Need for prevention of surface oxidation of the brass before bonding.

Moreover, brass-plating is not so satisfactory for bonding to light alloys. And it doesn't work so well in bonding nitrile rubber and neoprene. Chemical systems of

bonding have taken over. They work with a wider variety of metals and rubbers and give more reproducible results—economically. Much credit is due the rubber and chemical industries for their accomplishment in this area and for making today's bonds possible. The number of rejects in the automotive industry of rubber-to-metal bonded components has been reduced quite appreciably.

In the automotive business, the parts with which we are most greatly concerned with regard to the quality of the bond are the dynamically functioning parts. And of these, the most typical and important item is the engine mount. If and when failure occurs, why do we sometimes see perfectly clean separation of the rubber from the metal in certain large areas, and good adhesion with failure in the rubber in other areas of the same part? Of course we know cleanliness is important, but is there some other not - so - clearly - understood phenomenon at work here? Sometimes even in preparing specimens experimentally, when all known safeguards against introducing variability appear to be taken, we still are not entirely free from this problem.

There seems to be a difference of opinion regarding the type of metal surface which gives the best bond. A shot blasted surface is highly favored for uniform quality of the bond, but there are those who think that a polished surface gives somewhat superior bonds. What are the facts?

Returning for a moment to bond variability, do we have a problem of the prime coat slipping from certain portions of the metal during molding operations, particularly on more complex shapes where difficult flow patterns are encountered? If so, which primers (and interface materials) are least subject to such slippage?

Possibly not all, but a good many fabricators still have problems of corrosion of the metal after vulcanization. I understand it is a very elusive problem and the cause is not clearly understood, at least by many technologists. I am sure some enlightenment in this area would be welcomed by many. What polymers are most guilty of promoting corrosion? If neoprene is required, how can you be sure that corrosion can be prevented? Is there any problem in adhering neoprene to cast iron?

Low Temperature Performance

Low temperature performance of a rubber-metal part is extremely important in such items as the engine mount in the smooth, vibration-free "family of fine cars" today. And low temperature properties are becoming increasingly more important and will be more closely controlled. The rubber needs an anti-freeze. Ester type plasticizers are commonly used for this purpose. But it is believed that ester plasticizers may affect the prime coat, due to their migratory tendency, and deteriorate the bond.

Is there a certain level of ester plasticizers that can be tolerated with insignificant effect upon the quality of the bond, particularly in the well-aged condition? Are there other methods superior to the use of ester-type plasticizers to enhance low temperature properties and at the same time insure a non-degrading bond? As is so often the case in rubber compounding, certain properties are sacrificed somewhat to accentuate another. But in this case there is a very low limit tolerable on the sacrifice of bond quality to gain more uniform modulus at variable temperatures.

Certain rubber polymers require protection against ozone attack. Ozone-cracked rubber, flexed repeatedly, can develop into failure of the part. Waxes are commonly incorporated in the stock to reduce or eliminate such cracking. But wax exudes to the surface. It is in there for that very purpose. Does it also migrate to the inner, bonding surface and deteriorate the bond? If this is known to happen, do the new antiozonants, as replacements for the waxes, offer a satisfactory solution to this problem?

Relation of Bond to Stock Physicals

Another question which may be answered rather quickly is whether or not there is any important relationship between quality of the bond and such physical properties of the stock as tensile, elongation, tear and hardness. Certainly, if the stock is weaker than the bond, we do not get bond failure and consequently no actual measurement of bond strength. But in cases where the strength of the rubber exceeds that of the bond, do such relationships exist?

There has been great difficulty in obtaining good bonds with oil-extended stocks. What progress is being made in this area? One explanatory theory for this trouble is that the highly oil-loaded stock is placed into a hot mold. Traces of oil immediately volatilize and condense on surfaces to be bonded, applying, in effect, an anti-stick material to the surface. Of course, it would be difficult to get good adhesion to a greased surface. What is thought of this theory? Can anyone support it with actual facts? Nevertheless, the main point is whether or not real progress is being made in the problem of producing improved bonds with oil-extended styrene rubber, particularly on the softer stocks—50 durometer or lower.

And in regard to butyl rubber, let us follow up on it. What progress is being made in improving bond strengths of butyl rubber to allow high stress loads under vibratory conditions. The development of butyl rubber bonds has undoubtedly progressed to different levels at different companies. But from my inquiries, no one is particularly satisfied with it, and I get the idea that butyl rubber bond strengths generally are about half that obtainable with the other general purpose polymers. Much is to be desired here. Butyl rubber has many desirable properties as a material for mechanical rubber goods—low permanent set, good heat resistance, good ozone resistance, good damping—but it appears that bond strength is a distinct shortcoming at this time.

Some of the following questions and points are of more direct concern to us in the automotive companies. Generally speaking, you make the rubber-to-metal bonded products; we use them. But how do we know when we are getting a good bond? In other words, what is the best method to evaluate a bond? Many types of tests are in use—static shear to failure, static tensile to failure, and numerous dynamic type tests falling into either the continuous vibratory type or the impact type—in shear, tension, or compression. The correlation among the various types appears to be such that it cannot be depended upon.

Without going into detail, let me state that from my

experience and information, the bond that is superior on a one-pull static test may be far inferior on a dynamic fatigue test. It appears to me, therefore, that if the part functions dynamically in the vehicle, its bond must be evaluated on a dynamic test. And unquestionably, the more closely the test simulates severe operating conditions, the more valid is the test.

Such testing is time-consuming and short-cut methods are necessary, even at the sacrifice of some accuracy. Short of fatiguing the bond under simulated service conditions, what is considered the best method for evaluating a bond? In the development of bonding systems, what tests and time elements are used for comparative bond evaluations? It is easy to distinguish between a poor bond and a good one. But when the bond strengths are fairly high, differentiation seems difficult.

Simple straight pull tests give a good indication of the quality of the bond at the time of the test. But bond strengths sometimes change drastically with time. In fact, after corrosion sets in or the bond is attacked from within, an engine mount may practically fall apart. Of course, this is an extreme case, but every degree up to this limiting condition is possible. My next question, then, is: What may be considered a safe waiting period after manufacture to evaluate and approve a bond? Also, is it possible to accelerate the deterioration of a bond that normally occurs with shelf aging? Do high humidity or high temperature aging conditions speed up the breakdown? The industry certainly could employ to advantage an accelerated bondaging condition prior to evaluations of the bond.

So far we have been talking about vulcanized bonds. We would also like to know if it seems possible that some day we may replace the vulcanized bond with cold set adhesives that give strength equal to that of present day systems. A statement of progress and prospects in this area would be appreciated.

Bonding Problems of the Future

Looking at the future for a moment, we see "high-powered" polymers entering upon the scene, possibly accompanied by bonding problems. Solid urethane materials, with exceptionally high physicals, are expected to find their way into highly stressed mechanical rubber parts. Utilizing this exceptional strength will demand reductions in the volume of the elastomer and areas of adhesion. Engine mounts half the size of present day mounts may do an equally good or better job. But to do this job, double the present day bond strengths will be required if the bond is to equal the strength of the rubber. It is said that urethanes inherently stick to just about anything, but to stick at terrifically high stress may be another story. Is the rubber industry prepared to give us double present day bond strengths with urethane rubber?

Other new materials are numerous, indeed; but let us mention just one more material, or rather a family of materials—the fluorinated hydrocarbons. Aromatic content of fuels is rising. Vehicle operating temperatures are going up. Transmission oils are performing at ever-increasing temperatures. Although the cost of fluorinated materials is high, they apparently can take over where conventional and more economical materials fall down. Chances are that we will be using them in our vehicles some day in the not too distant future. Some applications undoubtedly will call for rubber-to-metal bonds, e.g., in seals of certain designs. Will the bonding of fluorinated hydrocarbons constitute a problem?

I have asked a lot of questions. It is now time to hear the answers.

Trends in Metal Preparation

By F. W. GAGE

Dayton Chemical Products Laboratories, Inc., West Alexandria, Ohio

RUBBER technologists responsible for developing and manufacturing rubber - to - metal bonded parts have long been aware that the common denominator for producing high-quality bonded parts is the preparation of the metal surface itself prior to bonding. No matter how much care is given to the compounding of the stock, or how selective one is in choosing the right bonding agent, if the metal surface is not properly cleaned and made reactive for bonding, a low-quality bond will result. Since the compounder is constantly under pressure to find ways to reduce costs, and yet maintain quality, considerable attention has been given of late to the development of less costly ways of attaining highly reactive metal surfaces capable of achieving good bonds with rubber.

For many years, brass plate was the standard surface for obtaining adhesion. However, today fewer and fewer parts proportionately are made with this type of construction. Equipment is fairly elaborate, careful control of the plating baths is required, certain limitations must be imposed on the compounding of the stock, and the method itself is susceptible to considerable variation. Nevertheless, excellent, long-lasting bonds can be obtained with brass plate if proper care is taken, and the specially designed booster coats now available are used.

However, the trend in rubber-to-metal bonding is toward the use of cements directly on the metal being bonded, and the remainder of my remarks will be directed toward these other methods.

Probably the most commonly used method of metal preparation is the grit or sand-blasting process. This has achieved the greatest commercial success, is relatively cheap in operation, lends itself to mass handling

of parts, and produces by and large the most reliable high-quality adhesion results of any process now known. For this process to be fully effective, the steel grit must be sharp and clean. This requires degreasing of the parts before blasting, if there is a substantial amount of oil or grease present, as well as constant separation of small particles of dirt, rust and broken grit from the supply of steel grit.

Size of grit is a factor, since large particles tend to become ball-shaped with use, providing a peening action rather than an abrasive action. This peening action, instead of producing a fresh, virgin surface, produces a work-hardened surface in which dirt and other surface impurities may be driven down into the pores of the metal. Such surfaces are sometimes more difficult to bond than is the unblasted metal. Nevertheless, with adequate control and surveillance, grit-blasting is the best means of assuring consistently high-quality adhesion.

However, there are a number of factors that should be kept in mind when considering blasting for cleaning metal. Freshly cleaned surfaces are susceptible to atmospheric attack and should be coated with cement soon after being prepared. In spite of the fact that blasted parts can be mass handled, there is a certain amount of manual labor required in carrying the parts through the blasting operation. Also, small parts do not lend themselves readily to cleaning by blasting.

Phosphate Treating of Steel Surfaces

A system that has been received with considerable attention in the last couple of years is the phosphate treating of steel surfaces preparatory to bonding. In this system, a coating of iron or zinc phosphate is applied by simply immersing the insert in a hot solution of the phosphate salt. Usually, a series of dips is required, including an acid cleaning, several washes and sometimes a chromate hardener besides the phosphate.

This system lends itself readily to conveyorized operation and can be used on small, fragile inserts that cannot be grit-blasted without being destroyed or worked out of shape. It also has a number of other advantages. It provides a degree of resistance to corrosion after the part is molded, prepares a fresh surface for bonding agents, and generally eliminates the need for more expensive surface preparation.

This system is being used commercially on a limited scale and, while some degree of success has been noted, it is, generally speaking, still in the development stage and additional study is required to assure reproducibility of results. Nevertheless, because it can be automated and used to cut costs in many set-ups, it is gaining a lot of careful attention.

Another chemical cleaning process that is being used to a limited extent is that employing an alkaline dip followed by washing and drying. While this process is simple, requires inexpensive equipment and can be conveyorized, reproducibility has been difficult, if not impossible, to obtain, and it can be used only in those cases in which only a fair degree of bond is required.

Other methods, such as acid dips, wire brushing, copper flashing, and preparing freshly machined or ground surfaces, are being used in bonding work, but only to a very limited extent. They are mentioned here only for sake of completeness.

In conclusion, grit blasting is still the preferred method of metal preparation in rubber-to-metal bonding because of its relative simplicity and the high degree of bond consistently attainable. Phosphate coating shows considerable promise and may become more important in time.

Trends in Rubber-to-Metal Bonding

By HOWARD H. IRVIN

Marbon Chemical Division, Borg-Warner Corp., Gary, Ind.

EVERY rubber compounder concerned with rubber-to-metal bonding would unquestionably like to have a universal adhesive which would bond most elastomers to most classes of metals. This adhesive should, of course, be 100 per cent effective under any assembly conditions that might be encountered in the plant and under any service requirements to which his customer will expose these assemblies in service. If one gives consideration, however, to the varying chemical composition of various elastomers now available, the different ways in which they can be compounded and the equally numerous variations in structure of metals to which the rubber compounds are to be adhered, the hopes for the development of such an adhesive are difficult to fulfill.

Nevertheless, the adhesives now available or under development, while certainly not meeting such high expectations, approach this goal closely, if one restricts such wishes to those elastomers which are currently most widely used and to those metals which are most commonly found in bonded assemblies.

The elastomers which are currently most frequently bonded are natural rubber, the styrene-type rubbers, nitrile rubber and neoprene. This picture will probably not change very markedly during the next five years. The use of other elastomers, such as butyl rubber, chlorosulfonated polyethylene, and stereospecific hydrocarbon rubbers, will, however, be growing, and it will probably be possible to bond most stocks compounded from the above named groups very effectively to most steels, aluminum, brasses and bronzes with a single adhesive. This will particularly be true if care is taken to compound the rubber stocks not only to meet certain specification requirements, but for maximum adhesion as well.

Over the years, great strides have been made in the development of chemical bonding agents, and the chances of obtaining 100 per cent adhesion consistently have greatly increased. Unfortunately, the development of test methods has not kept up with the development of improved adhesives, and reliable, non-destructive test

methods for evaluation of the rubber-to-metal bond are urgently needed.

Adhesive systems have been developed during the past years which have made adhesion less dependent on the environmental conditions that might exist at the assembly line, such as humidity, temperature or other difficult to control factors. There has recently also been a trend to try keeping metal preparation to an absolute minimum and obtain adhesion just the same. This appears to me to be a dangerous trend, since it is absolutely essential in any bonding process for the faying surfaces to be free of any contaminants that might interject themselves during the bonding process and interfere with permanent good adhesion.

While sand or grit blasting is most commonly used to clean metal surfaces to which elastomers are to be bonded, there are other effective methods for cleaning metal. A rough metal surface is certainly not essential to obtaining a good bond with a chemical bonding agent.

Bonding Agents for High Temperatures

As service temperatures for bonded assemblies are being boosted gradually, there has been an increasing demand for bonding agents which will withstand such higher service temperatures for prolonged periods. The tensile strength of conventional elastomers, however, decreases rapidly at elevated temperatures, and prolonged service above 250° F. is certainly not recommended for either natural rubber or the styrene rubber types, and even butyl rubber and neoprene maintain very little tensile strength above 300° F. Most adhesive systems currently available are as serviceable under such conditions as the elastomer compounds which they bond. Many heat resistance tests on such bonded assemblies have repeatedly shown that failures occur almost exclusively in the rubber compound.

Elastomers which are serviceable at temperatures up to 600° F. are being developed, however, and are beginning to be encountered in bonded assemblies. Such applications are still relatively few, but they are growing in importance and are very critical as, for instance, in oil seals of automatic transmissions, shock mounts for electronic equipment, special tank linings and others. These newer environments require not only an acceptable tensile strength at higher service temperatures, but improved resistance to lubricating oils, solvents, or corrosive chemicals as well.

The elastomers that are being encountered in such critical assemblies are based on silicones, fluorinated hydrocarbon polymers and even fluorinated silicones, as well as acrylic elastomers. Conventional bonding agents will not adhere these materials nor would they be resistant to the chemicals encountered in service. Fortunately for the adhesives chemist, even these elastomers exhibit tensile strength of only a few hundred pounds at service temperatures of 400° to 600° F., so that the bond strength which has to be developed is still relatively low compared to that required for conventional bonding agents. In view of the intensive development work that is being conducted, however, improvements in the tensile strength of such elastomers are to be expected during the next few years, and new adhesives will have to be produced to keep up with these developments.

Requirements of the Future

If one looks at the future requirements which such bonded assemblies may have to meet, then one realizes that all these new elastomers, which are only in their infancy, are already a thing of the past in this era of a rapidly changing technology. While only a few years ago the environmental range required by the armed services stretched from approximately —65° F. to +250° F., the range of tomorrow extends to unbelievable figures on both ends of the scale. The polymers to meet such requirements may very well be inorganic. The boron-phosphorus and nitrogen phosphorus systems are the most promising, we are told. Should these ever be found in the bonded assemblies under discussion, quite radical changes will occur in rubber-to-metal adhesion.

Having concluded that the bulk of bonded assemblies will continue to utilize the more common elastomers available today, what does the immediate future hold for the metals used in these assemblies? It appears that no major shift will develop away from those metals which are now most frequently encountered. Various types of steel will continue to make up the major portion of metals used, with perhaps increasing use of stainless steels, and a growing emphasis on the lighter metals, particularly aluminum, and somewhat less emphasis on such non-ferrous metals as the brasses and bronzes.

Parallel to the long range developments in the elastomer field, there is, of course, also a slow trend toward metals which maintain their strength at higher service temperatures and combine better corrosion resistance with lighter weight than the metals in common use today. These include tantalum, chromium, molybdenum, pure and in alloys, as well as zirconium, which, however, is of primary importance in the atomic energy program where rubber-to-metal assemblies are not generally encountered, and of course titanium.

Titanium is probably the most important of the metals mentioned; yet its widespread use is many years off, since there is a great time lag between the introduction of a new metal and its volume use. It takes considerable effort to develop proper processing methods for fabricating such new metals, as is readily exemplified by the market development history of stainless steels and aluminum.

In conclusion, I would merely like to emphasize that the picture in the rubber-to-metal bonding field is not likely to change very radically during the next few years. While many new systems will be encountered for which adhesives will have to be developed, their over-all volume will be relatively small. Advances are to be expected in the development of new adhesives and in the radical improvement of test methods for evaluating the rubber-to-metal bond.

Adhesion Compounding Aspects

By RUSSELL E. SAWYER

R. T. Vanderbilt Co., Inc., New York, N. Y.

ONE of the least discussed but yet one of the most important components of a rubber-to-metal fabrication is the body stock. Stocks used in such an assembly should be compounded to meet the service conditions under which they must operate. Not only must the compound initially give a high level of adhesion, but maintain it even under adverse service conditions.

In order for the compounder to develop a satisfactory stock, he should first carefully study the service specifications for the particular part in question, and from these develop a compound to meet the conditions specified. The compounder should always remember that adhesion is a function of the physical strength of the compound. In general, the high quality and high physical value stocks adhere well and give the best bonding properties, as would be expected.

Compounds in the medium hardness range, 50 to 60 Shore durometer, generally bond best. If possible, the loading and the plasticizer levels used in the compound should be adjusted so that the hardness of the vulcanizate falls within this range. If low durometer stocks are used, the reinforcing fillers in the compound should be kept as high as possible, consistent with the hardness range. The reinforcing fillers reduce necking and tearing and as a result higher bond strengths are obtained. To obtain satisfactory adhesion with any stock, it is necessary that adequate pressure is developed during vulcanization. This is particularly true with soft and thermoplastic stocks.

More care in the selection of the compounding ingredients for bonding work is required than for most applications. Certain materials are detrimental to adhesion in any concentration and others must be used only in limited amounts because of their adverse effect upon most commercial primers.

In reviewing the principles of compounding for adhesion, some of the factors that need to be considered are: (1) Elastomers; (2) Plasticizers, waxes, softeners; (3) Fillers; (4) Sulfur and Accelerators; (5) Antioxidants and Antiozonants, and (6)Processing.

Choice of the Elastomer

Selection of the elastomer is determined by the service conditions under which the assembly is to be used. Natural rubber should be used in any highly functional part such as vibration dampers, engine and instrument mountings, and track block pins. Styrene rubber is widely used for rolls, tracks, and diaphragm compounds. Whenever reasonably good oil and ozone resistances are required, neoprene is recommended. In general, better adhesion is obtained with Neoprene GN and W compounds than with the GRT or WRT types. Such applications as shaft seals, electric motor mountings, and solid tires are typical for neoprene.

The acrylonitrile-butadiene copolymers find their biggest use in those applications that require extremely high oil resistance. The easy processing polymers are best suited for adhesion work. Plasticizer content can be limited and a compound with good mold flow and wetting of the adhesive interface obtained without the derimental effect on adhesion of high plasticizer content.

The applications for butyl rubber are limited at the present time. Because of its excellent ozone resistance, this rubber is currently being used in the manufacture of tubeless tire valves, vibration dampers, and tank linings. The more unsaturated butyl polymers should be used for adhesion work since there are more sites available for cross-linking with the uncured adhesive film.

Some hydrogen chloride is evolved from neoprene compounds under high temperature conditions. If any moisture is present, the acid formed will accelerate rusting of steel inserts. Control of this condition can be achieved by the use of magnesium oxide and zinc oxide which act as acid acceptors. The use of epoxy resins of low molecular weight has also been suggested for this purpose although we have no data to support this.

Plasticizers, Waxes and Softeners

In compounding a stock for adhesion, excessive amounts of plasticizers, waxes, and softeners should be avoided. It is important that the plasticizer, wax, or softener selected be compatible with the polymer and not "bleed" or bloom from the stock when used in normal concentrations. Most waxy materials that are inhibitors of static atmospheric cracking are permissible in concentrations of one or two parts per hundred of RHC and will normally have no detrimental effect upon adhesion. In natural rubber and styrene polymers, two parts of plasticizer, on a 100 RHC, is generally sufficient, although amounts up to 5 parts of some have been used without affecting adhesion.

Softeners such as process oil, coal tar, petroleum derivatives and coumarone-indene resins show no harmful effect on adhesion, providing they are not used in excessive amounts. In highly loaded compounds, up to ten parts of these types of softeners are permissible. With high acid number plasticizers and highly unsaturated softeners, some increase in sulfur or accelerator is required to maintain the cure level of the compound.

In neoprene, the use of low temperature plasticizers such as the esters and polyesters should be avoided. It has been our experience that they promote rusting. Process oils and coumarone-indene resins are recommended as softeners for neoprene compounds that are to be used in bonding work. There have been no indications of rusting of the metal with neoprene vulcanizates that could be attributed to process oil in concentrations up to 20 phr. The combination of process oil and coumarone-indene resin makes a very effective softener blend for neoprene adhesion stocks.

Most of the low temperature plasticizers, except tributoxy ethyl phosphate, can be used in acrylonitrile-

butadiene adhesion stocks, providing a phenolic type bonding agent is used. Concentrations as high as 20 phr can normally be used without any detrimental effect on adhesion. Coal tar derivatives are also effective plasticizers for the nitrile polymers. If a halogenated elastomeric primer is used, the ester type plasticizers should be avoided. Plasticizers such as the coal tar derivatives, polybutadienes and liquid nitrile polymer should be used.

In butyl rubber, only plasticizers and softeners that are highly saturated should be used. Plasticizers having a high degree of unsaturation absorb the accelerator during vulcanization, thereby robbing vulcanizing ingredients from the bond interface. Saturated hydrocarbons in the amounts of two to five per cent are recommended.

Carbon Black and Mineral Fillers

In general, carbon blacks are most effective in producing compounds of optimum adhesion values. Channel blacks are particularly advantageous for use in natural and styrene rubber adhesion stocks. They retard the initial cure more than alkaline materials and permit the formation of more chemical bridges between the stock and primer.

Thermal blacks and zinc oxide are used extensively in mounting stocks requiring good resilience and heat resistance. They are also used advantageously in blends with other fillers. The structure furnace blacks can be used satisfactorily and are finding application, particularly in track block compounds.

Good adhesion can be obtained by the use of mineral fillers. However, the actual adhesion, pounds per square inch, using mineral fillers alone, is generally about half that obtained with reinforcing carbon blacks. Hard clays in combination with carbon blacks produce stocks with relatively high adhesion values. When using clay and channel black combinations, a slight increase in acceleration is required to offset the retarding effect on cure rate.

In neoprene, the softer blacks, such as the thermal blacks and SRF types, are most commonly used, producing stocks which are easy processing and have good bonding properties. The channel and high abrasion blacks are generally used in combination with softer blacks, clays or whitings.

In acrylonitrile-butadiene adhesion stocks, fillers such as MT thermal blacks, hard clay, SRF blacks, whiting and silicates are commonly used. These in combination with channel and structure furnace blacks produce good tensile properties and good adhesion characteristics.

In butyl polymers, the furnace and channel blacks are generally required to obtain the desired reinforcement and meet adhesion requirements. Blends of these blacks with thermal blacks result in a stock with good processing and adhesion characteristics.

Sulfur and Accelerators

Stocks containing normal sulfur usually give superior adhesion results. However, in order to meet aging requirements, it is often necessary to reduce the sulfur to a minimum. This is possible since good adhesion of low sulfur and sulfurless stock is obtained through the use of specially compounded cover cements. The adhesion of neoprene stocks is substantially increased by adding from 0.5 to 1.0 part of sulfur. Some sacrifice in compression set at room or elevated temperature will result, but the set properties at low temperatures will be improved.

In natural rubber and styrene rubber polymers, the major portion of the acceleration should be the thiazole or thiazyl type. The thiuram or dithiocarbamate type accelerators are not recommended as primaries, but can be used as secondaries. If it is necessary to use ultras as primaries for the low compression set properties they impart to natural and styrene rubber vulcanizates, a sulfur content as high as possible in line with other specification requirements will usually result in the highest level of adhesion. The initial cure rate should be slightly delayed so that the stock will not set up before adhesion is developed. Delayed action accelerators are recommended for use in natural and styrene rubber and Neoprene W compounds, particularly for bonding thick sections.

In contrast to natural rubber and styrene polymers, relatively large quantities of ultra accelerators are required to effect proper cure in butyl compounds. Through the judicious use of these ultra accelerators, both good tensile and adhesion properties can be obtained. An example of an acceleration of this type is the combination of 0.5 of a part thiazole and one part each of TMTD and Ethyl Tellurac. The dioxime curing system is also satisfactory for butyl rubber adhesion stocks. This system is scorchy and will discolor light colored compounds during vulcanization.

Antioxidants and Antiozonants

The addition of antioxidants and antiozonants in normal amounts causes no drop-off in bond strength. They do, however, definitely improve the aging characteristics of the compound. An antioxidant should be added early in the mixing stage, especially in the case of styrene rubber polymers, to prevent gel formation, which is detrimental to adhesion. Heat-resistant antioxidants not only improve the heat aging but also the flexing properties of the compound. The new type of antiozonants improve the ozone resistance, particularly of natural rubber and styrene polymers.

In no case should the antioxidant or antiozonant level be high enough to cause blooming in the uncured stock, since this would inhibit the formation of a satisfactory bond.

The mixing procedure should be carefully controlled to eliminate differences in plasticity from batch to batch. It is important to have good dispersion of all the ingredients in the batch to insure uniformity of adhesion results. During processing, especially extrusion, care must be exercised to prevent surface scorch which results in poor bonding to cemented metal. Dusting the stock with

talc or similar materials should be eliminated whenever possible. In order to obtain maximum adhesion, dusting powders like talc or soapstone must be washed from the surface of the stock with solvent prior to the bonding.

The stock should be preformed approximately to the size and shape of the insert. This will minimize the effect of stock flow and variation in stock grain. The age of the mixed stock will have an effect upon the adhesion. As a general rule, maximum adhesion cannot be obtained if the stock is over two weeks old. This is particularly true of compounds with poor scorch properties or excessive heat history during processing. The preformed stock which is ready for cure should normally not be over two days old for maximum adhesion.

The best bonding properties are obtained by curing the stock to an optimum state of cure or slightly beyond, using sufficient pressure to insure intimate contact of stock and bonding agent.

Adhesion Testing

By PETER J. LARSEN

Lord Manufacturing Co., Erie, Penna.

LITTLE comment need be made to establish the importance of rubber-to-metal bonding as an aspect of the rubber industry today. My brief remarks deal with means whereby we gain necessary information about this art and relate it to product design, manufacture and application.

To make a bonded assembly a process must be established, an adequate design must be developed, performance data under various environmental conditions must be determined and adequate production inspection methods must be set up. To complete such a program, we must be able to determine relative adhesion values under all conditions.

The problem of getting an adhesion value is still with us today. As far back as the middle of the 19th century, patents were recorded on the use of rubber in adhesive applications, but for a period of 50 years or more a pair of pliers was probably the only instrument used to check bond strength. (I dare say some of us are still using the pliers.) Tests in straight pull were carried out from the start of this century, but until recent times testing techniques have been shrouded in as much secrecy as have been details of good bonding compounds and processes.

Currently, most of the known and accepted practices of adhesion testing are embodied in the ASTM Standard D-429-55T Methods A and B. These are destruction tests on standard samples, involving the separation of the rubber from metal with a known force, which is then used to describe the bond value. Test samples are so designed and the forces so applied that the greatest possible stress is concentrated at the bond interface.

It is probably safe to say that this test is more widely used than any other to establish a manufacturing process, product design and makeup. However, there are other methods being employed or under investigation. This undoubtedly stems from the fact that D-429 has a certain limitation. Adhesive formulations and metal surface preparation techniques have progressed to a point where even this test does not insure a bond interface break at all times. If other than a bond interface break results then we must also describe the break that we do get, and cannot use the pull as an absolute value. For instance, a stock break means that we have a bond value something in excess of the recorded pull value. Analysis of such a break is subject to individual interpretation.

Advantages of Method B

Despite this limitation, D-429 is still a very useful tool. We favor Method B of this test, a 90° peel test, which is less apt to be affected by thickness diameter ratios and the modulus of the stock than Method A, which employs a sandwich type sample with metal discs bonded to the two faces of the elastomer.

The Method B sample is inexpensive and testing is fairly rapid. The sample lends itself readily to a reasonable control of the variables that could be encountered in processing or subsequent environmental exposure, so that effects of such differences on the bond can be studied.

While the values obtained may not always be as absolute as we would like, because of the simplicity and economy of sample design and the rapidity of testing, we can readily make enough test samples to get valid comparisons of the effect of the many variables involved in processing, product design and environmental exposure. Variables of processing include different metal cleaning procedures, different cements, different types of metal, various cement viscosities and coating thicknesses, humidity, layover time of cemented assemblies, handling techniques, cure times and temperatures, heat history prior to curing, cement sweeping during cure and others.

The sample also lends itself readily to making a large number of parts for checking the effect on bond of postcure operations, which are sometimes similar to environmental conditions encountered. Such things would include abnormal temperatures of grinding and machining, exposure to various cutting oils, rust preventives, water and the like, as well as to galvanic attack and various aging conditions.

Adhesion values obtained in all of these areas, under all these conditions, should provide a pretty fair basis for determining the process to use, the design to develop, and the application limits to recommend. And, unless some of us are compounding low-tear stocks to impress the customer with our "terrific bond," the Method B sample offers some potential of being modified still further, to get interface breaks under almost all conditions.

These modifications are currently under investigation by Subcommittee XX of ASTM Committee D-11. They

involve using the Method B sample and altering the testing equipment and technique so that we can check the effect of temperature, time and stress, keeping any two of these conditions constant while varying the other. There are many details to be worked out on this, but we believe most will agree, in principle, that a method which may insure our getting a bond interface break while varying, but controlling temperature, time and stress, has much to offer.

Testing of Production Parts

With a process set up and the design and makeup of our product fixed by results on these standard samples, we are now faced with the inspection procedure on actual production parts. Getting values here is a problem. We know of no other way to be absolutely sure of the bond on every part than to subject the part to a destructive force, exposing the "weakest link" in its makeup. This method, however, would obviously leave too few parts to ship.

However, if we have established an adequate process and process control to give us all the adhesion our product design and application needs, we can get by quite nicely. We can run a spot check destruction test using an established minimum force value as a passing criterion. Unless our design engineers have made things difficult for us by designing a part reflecting the stress considerations of the D-429 samples with their high stress at the bond features, we will rarely get a bond interface break. With the break thus in the rubber, we have only to control its qualities to meet the minimum requirements. Another method, actually a non-destructive test, is to proceed in the same fashion but to set up a minimum value short of failure but which is still severe enough to expose parts that are sufficiently sub-par to necessitate rejection.

Thus, the process is set up to give the best bond; design considerations favoring this bond are adhered to; and environmental requirements are kept within limits. When the product goes into service, we must keep alert for performance data to "feed back" into our process and design studies. Comparisons must be made constantly to keep abreast of increasing service and economic requirements. We currently know of no other way to stay in business.

After presenting their papers, the speakers answered questions submitted by members of the audience. A full transcript of the queries and replies will be published next month.

Coming Next Month . . .

Thermal Diffusivity of Butyl Rubber and Its Compounds. Part I: Determination of Diffusivity Coefficients — By Donald R. MacRae and R. L. Zapp, Enjay Laboratories, Linden, N. J.

A report on the results of experiments to determine thermal diffusivity coefficients for butyl rubber and some of its compounds, with data on the range of the coefficients and influence of such factors as state of cure and pigment loading.

Rubber-Marlex 50 Polyethylene Blends—By H. E. Railsback and R. C. Wheat, Research Division, Phillips Petroleum Co., Bartlesville, Okla.

A new linear polyolefin offers significant advantages in compounding rubber stocks for numerous applications; the authors present a study of its effects and their advantages for use in commercial products.

The Absorption Spectrum of Carbon Black Dispersions—By Andries Voet, J. M. Huber Corp., Borger, Texas.

Information on the light absorption characteristics of available commercial carbon blacks, and the significance of these data for research.

Questions and Answers on Rubber-to-Metal Bonding.

The panel discussion featured at the October 25 meeting of the Akron Rubber Group closed with a question-and-answer period. The speakers' solutions to the problems posed them will be published in full.

Editorials..

Greetings

► With each passing year, the Christmas season assumes a greater significance, for it is the one time of the year when men speak of peace and seem to place some sober attachment to the words. And so what better wish could we express for the Season and for the New Year—peace for the world. With this solemn hope, may we extend to our many friends in the industry the tidings of the season.

THE PUBLISHERS

Unique Industry!

► In readying the 1957-58 RUBBER RED BOOK for the printer, we were struck by some rather interesting statistics which have great bearing upon the rubber industry. Back in 1937, when the first edition of the RUBBER RED BOOK was published, there were listed some 780 rubber companies in the United States. By the post-war year of 1945, this figure had risen to about 880 companies. Following World War II, the economy of the country began a rapid expansion, and this condition was reflected by the rubber industry. In 1947, the RUBBER RED BOOK listed slightly more than 1,000 rubber manufacturers and this figure rose to some 1,050 companies by the time the 1949 edition was in print.

Two years later, the 1951-52 edition carried listings for some 1,150 companies and the 1953-54 edition listed 1,270 companies. This last figure was increased by about 50 when the 1955-56 edition went to press. The new edition of the RUBBER RED BOOK, covering the years 1957-58, lists close to 1,500 companies! These figures, it seems to us, speak loudly of the vitality of our industry.

Many of us are aware that in the past years there has been a trend toward amalgamation in this country. While sales figures have generally gone higher and higher, the number of companies involved in a given field has tended to decrease. This has not been the case in the rubber industry. Rather than decreasing, the number of companies active in the field has been on the increase, and the percentage of increase with the passing years has been astonishing. That so many persons active in the field have chosen to form their own companies is a remarkable fact. That so many investors have chosen the rubber industry in which to place their money is most heartening.

Let there be no notions of "rapid turnover" in the industry either. Companies in the rubber industry do not appear only to drop out of the picture a few months later. Statistics available from the National Credit Office indicate that in the eighteen-year period ending 1957, there were approximately fifty business embarrassments in the industry! During the same period of time the number of companies in the field just about doubled.

Sales of rubber products for 1957 are estimated at about $6 billion dollars. It can reasonably be expected that this figure will continue to climb. Since 1950, sales in the rubber industry have been increasing in increments of about one-quarter billion dollars a year. We hold high hopes for the future.

What makes the general picture so exciting is the fact that during the years since World War II the industry went through some extreme situations. Who will forget the fears expressed by so many when the government finally decided to relinquish the synthetic rubber plants to private industry? How many alarms have been sounded about the natural rubber market? What of the whole new technology that had to be mastered with the general adoption of synthetic rubber? What of the introduction of the polyurethanes—the isoprene rubbers—the polyethylenes?

All these matters were taken in stride. Surely there have been many problems confronting the industry. When one looks back, however, one cannot fail to be impressed by the manner in which the rubber industry argued its points, fought its battles and succeeded in rising to new heights.

It was said in many quarters that, with the introduction of the chemical rubbers, the romance had gone out of the industry. Everything, it was said, seems to be taking on a more mechanical outlook, things "ain't what they used to be!" To these dour souls we would say, look around—see what has been accomplished—think of what is going to be accomplished. The rubber industry is a good place to work and will continue to be so. We expect to attract our fair share of bright young people and we intend to make things attractive for them so that they will stay with us. The past has been a proud experience—the future looks even better.

Rubber Red Book

► Many of our friends in the rubber industry have been questioning us as to the publication date of the 1957-58 RUBBER RED BOOK. We can now state with certainty that copies of the directory will be in readers' hands within the next few weeks. Factors of which we spoke just a few paragraphs back—the phenomenal growth of the industry—made more complex the compilation of data, more involved the check-back. The end result, however, will be a directory more than one-hundred and fifty pages larger than the previous edition. It is not by accident that the directory has been recognized as the "indispensable" book in the industry. A great deal of painstaking care goes into its publication. We want the RED BOOK to continue to be "indispensable." We beg your indulgence and we hope that you will find the 1957-58 edition worth the wait.

Highlights Sidelights *of the News...*

December, 1957

About 200 of the nation's leading rubber manufacturers attended the 42nd Annual Meeting of the Rubber Manufacturers Association in New York City . . . The theme of the meeting was "The Rubber Industry—A Record of Successful Performance" . . . The panel discussion which followed featured a number of interesting papers which analyzed the present and the future of the rubber industry (page 491).

A new set of guides for tire advertising has been issued by the Federal Trade Commission, marking a major shift in plans to carry out fair trade practice regulations . . . The shift, from enforcement to voluntary compliance, reflects the commission's aim to improve advertising standards by giving advertisers a clear idea of what is considered the border line between fair and unfair presentation of products (page 495).

A legal batle begun in 1949 came to a close recently with the award of a tubeless tire patent to Frank A. Howard, retired vice-president of the Standard Oil Co. (N.J.) . . . The issuance of the patent was delayed by interference proceedings in the U.S. Patent Office . . . The newly issued patent is now under contract of sale to a major tire manufacturer (page 496).

Goodyear has announced the completion of new production facilities which will boost the rated capacity of its synthetic latex plant at Akron, Ohio, to 27,500 long tons annually . . . The new facilities are said to have cost $2.75 million . . . The installation was originally built and operated by Goodyear for the Government and was the first of the nation's synthetic rubber plants to go into full production (page 499).

The synthetic rubber pilot plant and laboratory at Akron, Ohio, owned by the Government since 1944, has been purchased by Firestone and will be integrated into the company's synthetic rubber operations . . . The purchase includes a two-story building and six acres of land adjacent to Firestone's headquarters buildings in Akron . . . The sale has been approved by GSA, the Bureau of the Budget and the Attorney General's Office (page 501).

The board of directors of Philip Morris, Inc., has approved in principle the acquisition of the Franklin Research Co., Philadelphia, Penna., and Polymer Industries, Inc. of Springdale, Conn. . . . The latter company is active in the industrial adhesive field (page 505).

Executive Compensation in the Rubber Industry

Special Industry Report

IN 1956 rubber executives lost position relative to executives in other industries as far as their compensation was concerned. However, the executive compensation climate in the rubber industry still remained a favorable one.

These facts stand out in a study made for RUBBER AGE by James P. Jones of McKinsey & Company, Inc., management consultants with headquarters in New York. The study is an extension of an 18-industry report which McKinsey's staff prepares annually. This year's report appeared in the September-October issue of the *Harvard Business Review*. As published there, it did not include data on the rubber industry.

Source material for the present study and for the 18-industry report is data filed with the Securities and Exchange Commission by 641 companies listed on the New York and American Stock Exchanges. In the case of the rubber industry, the data encompasses 22 companies engaged in manufacturing all kinds of rubber products except electrical wire and cable.

The term "compensation" as used throughout this article and in the accompanying tables and charts includes salary, bonus, and deferred compensation awards payable prior to termination of service; it excludes contributions to pension, profit-sharing, and thrift plans and deferred compensation awards payable only at retirement or other termination of service.

Table I shows the average change in the compensation of the chief executives in 19 industry groups between 1955 and 1956. It will be noted that in 14 of the 19 industry groups they received higher compensation in 1956 than they did in 1955. Chief executives in the rubber industry, on the other hand, received lower compensation in 1956 than they did in 1955. The average increase in chief executives' compensation in all 641 companies studied was 5.1 per cent. This compares, as is indicated in Table I, to an average decrease in chief executives' compensation in rubber companies of 2.2 per cent.

Figures 1 and 2, which carry the comparison between the rubber industry and other industries one step further, relate the compensation of chief executives to company sales and profits. Each dot represents the compensation of one chief executive in the rubber industry. The solid line is mathematically fitted to portray the average compensation of chief executives in the rubber industry at various levels of sales and profits. The broken line is similarly fitted to indicate the average compensation of chief executives in the remaining 18 industries listed in Table I at identical levels of sales and profits.

It will be observed that the solid line on Figures 1 and 2 is above the broken line at the low ends of the sales and profits scales, but below the broken line at the high ends of those scales. This appears to indicate that smaller rubber companies tend to pay more compensation to their executives than smaller companies in other industries, while larger rubber companies tend to pay less compensation to their chief executives than larger companies in other industries.

Actually, the smaller rubber companies exert such a dominant influence on the average line of the industry that only the first portion of the foregoing hypothesis is correct. The error of the last portion is clearly demonstrated by the fact that the dots representing the compensation of chief executives of three of the five largest rubber companies not only are above the rubber industry average line but also are above the average line of the remaining 18 industries.

What Figures 1 and 2 really show is that, even after losing relative position in 1956, chief executives of the smaller rubber companies were still paid more on the average than chief executives of smaller companies in other industries, and chief executives of larger rubber companies were still paid about as much on the average as chief executives of larger companies in other industries.

Table II sets forth the compensation of second, third, and fourth highest paid exe-

TABLE I—CHANGES IN CHIEF EXECUTIVES' COMPENSATION, 1955—1956

Industry	Average Per Cent of Increase or Decrease, 1956 Compared to 1955
Non-ferrous Metals	9.1
Steel and Iron	9.0
Public Utilities	6.9
Petroleum and Natural Gas	6.2
Heavy Machinery	4.8
Food and Beverages	4.4
Railroads	4.3
Light Machinery	4.2
Building Materials	3.6
Paper and Paper Board	3.2
Chemicals	2.4
Electrical Equipment	2.2
Aircraft Manufacturing	1.3
Department Stores	0.2
Tobacco	—0.1
Automotive Parts	—1.1
RUBBER	**—2.2**
Retail Chains	—2.4
Textiles	—6.0

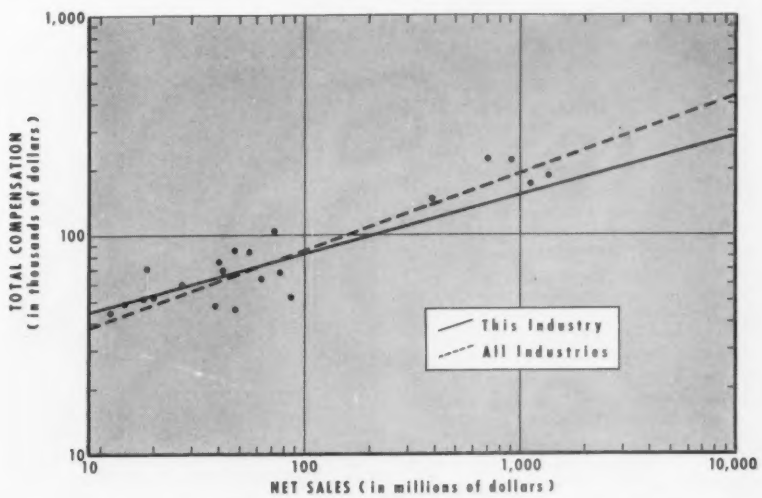


FIG. 1—Compensation of chief executives related to net sales, 1956.

Companies studied in making this report: Acushnet Process, American Hard Rubber, Armstrong Rubber, Baldwin Rubber, Dayton Rubber, Detroit Gasket, Firestone Tire & Rubber, General Tire & Rubber, B. F. Goodrich, Goodyear Tire & Rubber, Hewitt-Robins, I. B. Kleinert, Lee Rubber & Tire, Mansfield Tire & Rubber, O'Sullivan Rubber, Plymouth Rubber, Raybestos-Manhattan, Seiberling Rubber, Sheller Manufacturing, Thermoid, United States Rubber and Wooster Rubber.

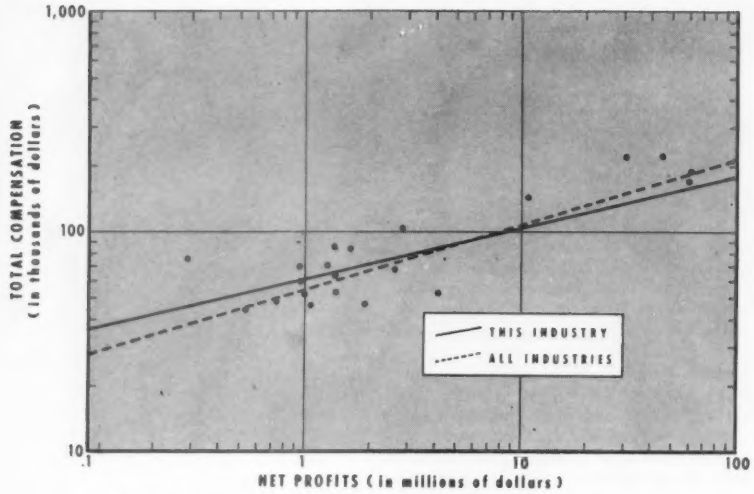


FIG. 2—Compensation of chief executives related to net profits, 1956.

cutives, expressed as a percentage of the compensation of chief executives, for the rubber industry and the other 18 industries studied. In each case the percentage listed is the median percentage for the particular industry involved.

Number two, three, and four executives in the rubber industry all benefit from the above-average scale paid to chief executives in that industry. Number two executives further benefit from the fact that their compensation bears a higher than average relationship to their chief's compensation. The latter benefit does not exist in the case of number three and number four executives, for their compensation bears just about the same relationship to their chief's compensation as do the compensations of number three and number four executives in the average of all 19 industries.

Influence of Sales and Profits

The 5.1 per cent average increase in chief executives' compensation in all 641 companies studied was accompanied by an 11 per cent average increase in sales and a 10 per cent average increase in profits. The 2.2 per cent average decrease in chief executives' compensation in the rubber companies studied came about despite a 3.2 per cent average increase in sales and a 5.5 per cent average increase in profits.

These figures lead to the conclusion that changes in sales and profits have less influence on executive compensation in the rubber industry than they do in other industries. An analysis of what took place in individual rubber companies in 1956 supports this conclusion. It shows that executive compensation moved in the opposite direction from both sales and profits, but especially from profits, in a significant number of rubber companies, while in other rubber companies it failed to move at all despite above average changes in sales and profits. Parenthetically, it can be added that personnel changes were not responsible for the discrepancies.

Nine rubber companies paid their chief executives less in 1956 than they paid them in 1955. Only four of these companies suffered reductions in both sales and profits. Two lost sales but increased their profits. The remaining three increased both their sales and their profits.

Five rubber companies paid their chief executives more in 1956 than they paid them in 1955. All of these companies increased their sales but two of them experienced declines in profits.

Six rubber companies paid their chief executives the same amount in 1956 as they paid them in 1955. One of these six companies lost a higher percentage of both sales and profits than all but one of the nine companies that decreased their chief executives' compensation in 1956. Four others realized gains in both sales and profits that averaged substantially higher than the corresponding gains of the five companies that increased their chief executives' compensation in 1956. The other had a minor gain in sales and a minor loss in profits.

Supplementary Benefits

At the close of 1956, 91 per cent of the rubber companies studied had pension plans for their chief executives, 45 per cent had deferred compensation contracts and 36 per cent had stock options. The corresponding 18-industry percentages were 90 per cent for pension plans, 26 per cent for deferred compensation contracts and 55 per cent for stock options.

Nine per cent of the rubber companies studied also had profit-sharing or thrift plans for their chief executives by the end of 1956. Here, the corresponding industry-wide percentage is not available.

In comparing the retirement programs of various companies, it is necessary to assume that employment will continue to normal retirement age, and that current compensation and the provisions of retirement programs will remain unchanged to normal retirement age. Making these assumptions, and taking into consideration the provisions of deferred compensation contracts effective upon retirement, as well as the provisions of pension plans, the retirement programs of the rubber companies studied provide the chief executives of those companies with retirement incomes equal on the average to 29 per cent of their current compensation.

Three of the rubber companies studied have no retirement program at all for their chief executives. Three others have programs that provide their chief executives with retirement incomes equal to 60 per cent or more of their current compensation. While there are exceptions, the rubber companies that offer relatively liberal retirement benefits to their chief executives tend to be the same rubber companies that pay their chief executives at a relatively high level currently.

TABLE II—COMPENSATION OF SECOND, THIRD AND FOURTH HIGHEST PAID EXECUTIVE AS A PERCENTAGE OF COMPENSATION OF CHIEF EXECUTIVE—1956

Industry	Median Percentage		
	Second Highest Paid Executive	Third Highest Paid Executive	Fourth Highest Paid Executive
Department Stores	81%	73%	64%
Retail Chains	81	67	57
Paper and Paperboard	80	70	58
Non-ferrous Metals	79	59	57
RUBBER	**75**	**58**	**50**
Tobacco	74	63	52
Heavy Machinery	74	59	49
Aircraft Manufacturing	74	56	52
Electrical Equipment	72	60	53
Chemicals	71	60	54
Light Machinery	70	56	52
Petroleum and Natural Gas	68	59	50
Automotive Parts	67	57	54
Steel and Iron	67	56	47
Building Materials	67	53	43
Food and Beverages	66	60	52
Public Utilities	64	49	47
Textiles	61	55	55
Railroads	57	48	44
Average	71%	59%	52%

RMA Holds 42nd Annual Meeting on November 21 in New York City

200 of the Nation's Leading Rubber Manufacturers Hear Panel Discussion on "The Rubber Industry—A Record of Successful Performance"

► Some 200 of the nation's leading rubber manufacturers attended the 42nd Annual Meeting of the Rubber Manufacturers Association, Inc., held on November 21 at the Park Lane Hotel in New York City. The theme of the meeting was "The Rubber Industry—A Record of Successful Performance." Ross R. Ormsby, president of RMA, delivered the introductory address, setting the tone for the panel discussion which followed, including papers by John L. Collyer, chairman of the B. F. Goodrich Co.; W. J. Sears, vice-president of RMA; R. E. Davis, Director of the Business Research Department of the Goodyear Tire & Rubber Co., and John D. Wilson, vice-president of the Chase-Manhattan Bank of New York.

Ten Elected Directors

At the business portion of the meeting, ten rubber industry executives were re-elected to the RMA board of directors. Re-elected for terms expiring in 1960 were: A. H. Wechsler, vice-president and general manager of the Converse Rubber Corp. of Malden, Mass.; R. C. Firestone, president of the Firestone Tire & Rubber Co. of Akron, Ohio; J. L. Collyer, chairman of the B. F. Goodrich Co. of Akron, Ohio; E. J. Thomas, president of the Lee Rubber & Tire Corp. of Conshohocken, Penna., and H. E. Humphreys, Jr., chairman of the U. S. Rubber Co. of New York, N. Y.

L. R. Jackson, vice-chairman of the Firestone Tire & Rubber Co. of Akron, Ohio, was elected to a term expiring in 1959; and the following were elected to terms expiring in 1958: T. W. Miller, Jr., president of the Faultless Rubber Co. of Ashland, Ohio; J. W. Keener, president of the B. F. Goodrich Co. of Akron, Ohio, and L. E. Spencer, vice-president of the Goodyear Tire & Rubber Co. of Akron, Ohio.

John L. Collyer

In his address on "Progress in Rubber," Mr. Collyer declared that Russia's scientific achievement in orbiting its satellites "over our own cities on a schedule which we cannot alter by a second" is fortunate in that it has driven home to the people of the United States the blunt fact that American technology is not invincible. This achievement, he said, "emphasizes our reliance upon the scientific and productive ability of the United States and on its related financial capacity to accomplish whatever the American people determine to do to preserve our way of life".

Speaking for the industry as a member of the RMA Board, Mr. Collyer asserted that "the strength of our scientific and productive ability . . . if we are to remain free . . . is just as strong as the soundness of the dollar and the profit generated by American enterprise, and no stronger." Mr. Collyer reviewed the industry's past progress and laid down for his audience six pointers to future progress that would help manufacturers keep pace with the demands of a growing economy.

Specifically, he urged: (1) intensified research; (2) increased consumption of synthetic rubber; (3) protection of customers from the effects of international commodity agreements and restriction schemes; (4) improved industry communications with the public and its customers, employees and shareholders; (5) pursuit of company policies which will contribute to curbing inflation and preventing serious deflation by striving to increase productivity, making capital expenditures for progress, avoiding wage and employee cost increases in excess of productivity increases and by providing products of superior quality, and (6) pursuit of individual company policies and programs for earning the reasonable profits essential for growth and progress, for financing expansion and plant improvement, and for assuring employment at wage levels that will afford employees a continued high standard of living.

In reference to new materials, Mr. Collyer said "a long-worked-for discovery was made in 1954 of a genuine man-made rubber, a duplicate of natural rubber. This magic development is a fulfillment of our country's 'declaration of independence' from foreign sources of rubber supply in an emergency."

Hails Technical Progress

Ross R. Ormsby, in his talk, hailed further technical progress which had enabled the industry to chalk up a new synthetic rubber consumption record in 1957. He said the industry's percentage use of man-made rubber in relation to total new rubber would top 63 percent for the first time, in the absence of wartime controls.

An impressive presentation of new data on the employee, customer and shareholder economics of the rubber industry was unveiled at the meeting by Mr. Davis in his paper on "Rubber Industry Performance." These data were developed by the new RMA Economic Committee. On the employee side, Mr. Davis pointed out that

gross hourly earnings of production workers in the rubber manufacturing industry had risen 65 percent between 1947 and 1956 and that tire and tube production workers' average earnings of $2.64 an hour in September, 1957, put them in the front rank of U. S. production workers in terms of earning capacity. These figures are exclusive of supplemental wage costs, which have increased from 26 cents an hour in 1947 to 65 cents an hour in 1956, and which now aggregate an average of $1,300 per year per employee.

As a prime example of what is back of the page price spiral, Mr. Davis noted that while total wage costs rose 60 percent between 1947 and 1956, output per man hour had risen only 24 percent, with the result that unit wage costs had risen 30 percent in that period. This has occurred, he said, despite the industry's great increase in capital investment, improved management efficiency, greatly expanded research and development and a higher ratio of "back-up" non-production and distribution employees. "The rubber industry along with all other industry has been hesitant to pass along all of these added costs to the consuming public, with the result," he said "that industry generally today is caught in the well-known profit squeeze."

Industry Doubles Sales

In the 10-year period under review, Mr. Davis said the industry had nearly doubled its sales to $6.2 billion in 1956, and that upwards of 40,000 products produced in its factories are basically associated in the public mind with service, reliability, comfort and safety. Constant research and development and utilization of new materials operates to add substantially to the service life and utility of all of these products, he said.

Mr. Davis said the industry spent $3.4 billion in 1956 on services and materials and nearly $2 billion on wages, salaries and supplemental benefits. He estimated 2½ million men, women and children depend directly upon these rubber industry expenditures for their economic well being, exclusive of those concerned with the wholesaling, retailing, warehousing, transportation and raw materials requirements of the industry. Exclusive of excises, the industry paid out $353 million in taxes in 1956 to help meet the ever increasing costs of federal, state and local governments.

On the fiscal side, Mr. Davis stated that the industry's profit on invested capital amounted to nine percent in 1956 as compared with 10 percent for all industry. Return on a percent of sales amounted to only 4.4 percent as against 5.3 percent for all the manufacturing industry average. He stated that the industry's shareholders ploughed 63 percent of their earnings back into the business in 1956 to provide for increased productivity, expansion of the business, to improve old products, create new products, more and better jobs, and to make their investment more secure and maintain dividends. Despite this, he said, the industry had been compelled to borrow heavily to finance growth and offset inflation.

Mr. Sears, speaking on "Rubber Supply-Demand," reviewed the rubber supply demand outlook and predicted that there will be ample supplies of new rubber to meet expanding world demand over the next several years but only if the free world apart from the United States learns how to use more synthetic rubber and substantially increase its synthetic rubber use pattern. (Please see bar graph which appears elsewhere on this page—*Editor*)

"Whether we will have a sufficient supply of natural rubber at reasonable price

W. J. Sears

to meet our future requirements depends largely," he said, "upon how rapidly the rest of the world converts to increased proportions of synthetic rubber. I believe foreign rubber manufacturers will convert for their own economic interests, for they are aware that the only alternative is exorbitant, uneconomical prices for natural rubber," he concluded.

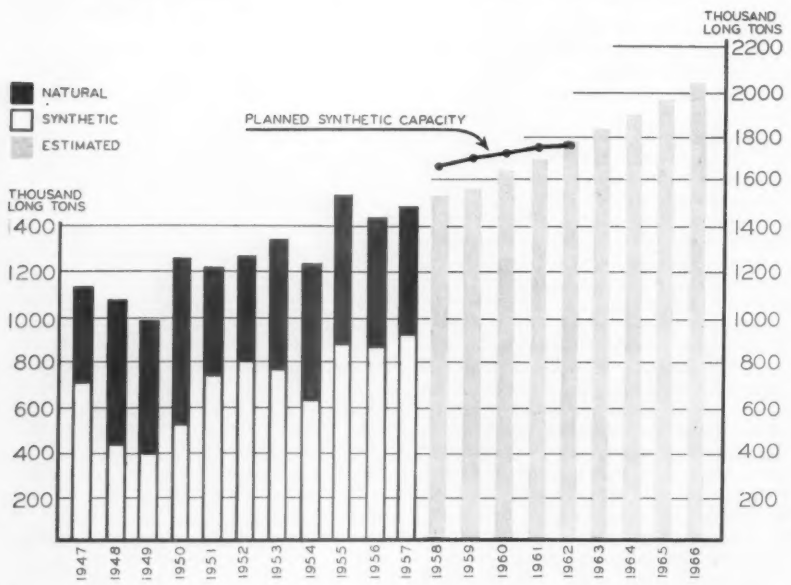
Rising government outlays should act to offset at least a part of the decline in capital expenditures forecast for 1958, said Mr. Wilson in his paper on "Business in 1958." "The advent of Sputnik appears to have had two major consequences insofar as the Federal Budget is concerned," Mr. Wilson said. "First, it has reduced the extent to which defense expenditures are likely to be cut in this fiscal year. Total Federal expenditures might add up to $73 billion on an administrative budget basis for the current fiscal year. Moreover, I don't think we should be surprised if the Federal Budget runs to $74 billion or more in fiscal year 1959." He added that the pattern of Federal spending "may decline slightly through the first quarter of 1958 and then begin to rise again. At the same time the road program will be shifting into higher gear, and spending by state and local governments will expand further."

Business Community Holds Key

Mr. Wilson, who is in charge of Chase Manhattan's Economic Research and Publications Department, said that to a considerable degree the American business community itself holds the key to its future over the next several years. "Throughout much of the past decade," he said, "business has operated in a climate of confidence — confidence that the American people were capable of so managing their affairs that the nation would continue to live in peace and enjoy the fruits of economic progress. I see no reason—no basic changes—that should cause any alteration in this fundamental outlook."

In a recapitulation of RMA activities

► Consumption of New Rubber in the United States ◄



Source: U.S. Commerce Department and Rubber Manufacturers Association.

John D. Wilson

during the year, it was reported at the meeting that the continued growth of the industry is assured through the spending of more than $200,000,000 in the current year for plant and equipment improvement. This also assures customers of better product performance and service at the lowest possible cost. This highly productive year was reflected in the activities of the various RMA divisions.

Legislative problems in the fields of taxation, distribution and revision of anti-trust laws, required the attention of the Tire, Footwear and Sundries Divisions and the General Tax Committee of the Association. These groups had the cooperation of the Association's Washington staff.

One of the Mechanical Goods Subdivisions is making a substantial contribution to the industry with its publication of a Cooperative Educational Handbook on Molded, Extruded, Lathe-cut and Chemically Blown Sponge Products designed to help specifications engineers and purchasing agents cut costs.

Following the Crude Rubber Committee's introduction last February of new International Standards for natural rubber, the Joint RMA-RTA Type Sample Committee scored a new record in the production of type sample books. The Singapore Chamber of Commerce Rubber Association's request for a conference on quality and packing problems indicates that the RMA committee has a difficult road to follow in firmly establishing its concept of international quality standards.

Contract Clause Book

In the field of industrial relations, the new RMA Contract Clause Book, published in September, 1956, received wide acceptance as a research tool, designed to keep negotiating teams abreast of industry developments in contract negotiations. This group has a new subcommittee on incentive systems. The annual Industrial Relations Conference provided an opportunity for industry personnel in this field to exchange views on common problems.

Ross R. Ormsby

R. E. Davis

The Traffic Committee stepped up its activity in the past year and shortly plans to unveil for industry consideration a program which it believes can result in a substantial reduction in transportation costs. This could well provide a material offset to the 107 per cent increase in general transportation costs which has taken place since 1946.

The Association's new Economics Committee, in cooperation with the Public Relations group has assembled new data on economic aspects of the industry which will be presented as a part of our 42nd annual meeting program. This committee will continue to work on special assignments.

Several divisions were active in the field of product promotion: the Tire Division in the "Safe Tires Save Lives Program," and its winter tire promotion; the Flooring Division in its first annual design awards contest, and the Heel and Sole Division through participation in the "Silver Cup" competition.

"Sanitized" Process Finding Applicability in the Rubber Industry

► According to Harold Sadev of the Rubber and Plastics Division of the Sanitized Sales Co. of America, 181 Madison Ave., New York 16, N. Y., the "Sanitized" method of protecting materials of all types against the development of odor-causing bacteria, mold and mildew, is finding increasing applicability in the rubber industry. At this time, thousands of products of every type and description, made by over 600 companies, are labeled "Sanitized".

Of particular significance is the fact that claims made on behalf of Sanitized have been accepted by the U.S. Department of Agriculture. These include the words "nontoxic, non-irritating, antiseptically and hygienically clean." Recently, Sanitized was accepted by the Advertising Committee of the American Medical Association for advertising in "Today's Health", in the official AMA consumer publication.

The company states that Sanitized has been successfully incorporated in all the important types of rubber, including latex, foam rubber and molded rubber articles. Sanitized has been incorporated in products made by many different processes, including calendering, molding, foaming, dipping and coating.

Companies Conducting Tests

It is reported that an increasing number of firms are now conducting their own tests on the use of the Sanitized process in their products. Among the products which currently carry Sanitized tags are such items as pillows, bathing caps, footwear, baby pants, hospital sheeting, linings, crib sheets, heating pads, gloves, aprons, and coated ironing board covers.

Such companies as General Tire; Goodrich, Firestone, Gordon Lacey, Dualoy, Harte, Elm Coated Fabrics, Pantasote, and others, are now turning out base or end products incorporating the process. It is stated that some eighteen rubber companies are now testing such products as combs, toothbrushes, dolls, girdles, toys, balloons, mattresses and "falsies".

Sanitized Sales Co. of America states that in practice, Sanitized is added to the compound. No extra machinery is necessary. As it is added at this stage of manufacture, Sanitized becomes an integral part of the compound. Boiling tests have shown that heat which resulted in a melting of the rubber left the Sanitized intact. Washing tests, both hand and mechanical, show that Sanitized lasts through repeated washings, the company claims.

It is maintained that the use of Sanitized will permit the purchase of rubber products with built in protection against odors, mold and mildew.

Italian Group Hears Sparks On Synthetic Developments

► Tires of the future may be a composite of several new synthetic rubbers leading to revolutionary concepts of tire manufacturing, according to Dr. William J. Sparks, of the Esso Research and Engineering Co. Dr. Sparks predicted the development of synthetic rubbers tailor-made for each vital part of a tire such as the treads, sidewalls, beads and plies, in a recent talk before the Instituto di Chimica Industriale in Milan, Italy. A multi-synthetic tire would give greater over-all performance, he said. Resistance to abrasion, heat and chemical attack would be strengthened throughout the tire and the serviceability and safety features would be improved, the speaker said.

At the present time, mass-produced vehicle tires are made with a combination of styrene and natural rubber. Each of these has common strong and weak points, and various additives and modifiers must be used to counteract the disadvantages. Dr. Sparks said butyl synthetic rubber's "departure from the classical concept of synthetic structure has pointed the direction for the development of new, compatible synthetics to do new jobs."

In his address, Dr. Sparks reviewed research during the past two decades aimed at a better scientific understanding of how and why rubber behaves as it does. His talk also dealt with the development of butyl rubber from the laboratory to use in inner tubes and hundreds of other products. He recalled that all-butyl car tires are being successfully produced on a small scale now and that the United States Army recently announced the development of an all-butyl, heavy-duty truck tire.

Forecasts New Rubbers

He forecast the development of "a wide spectrum of new synthetic rubbers." These will be rubbers with chemical make-ups similar to butyl's. The advantage is that they will make possible a broad selection of rubbers for the construction of composite tires, better in all respects than those made of only one rubber.

These rubbers of the future, Dr. Sparks predicted, will lend themselves to the vital vulcanization step through agents other than sulfur. Sulfur is presently the commonly used material for bringing about the vulcanization process.

The Esso Research scientist, who holds more than 100 patents, said scientists have now unmasked the role of carbon black in rubber. Carbon black has been universally used to strengthen rubber. But while helping in this way, carbon black also hurts rubber by damaging its elastic properties — unless properly and widely dispersed. The investigations revealed much important scientific information for the first time on how carbon black can be dispersed better.

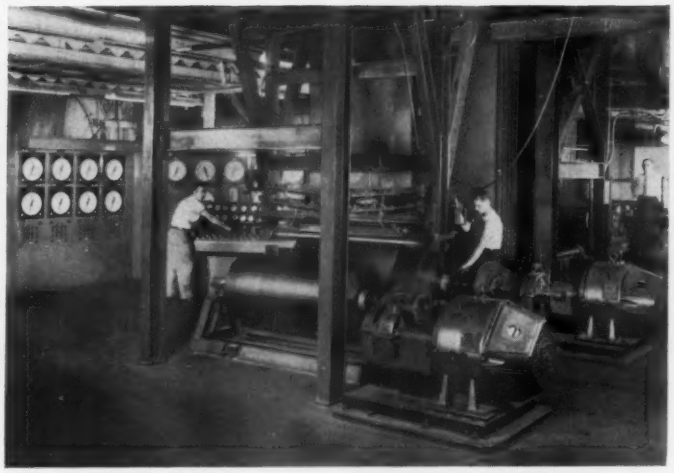
A main point of Dr. Sparks' lecture, from a scientific researcher's viewpoint, is that the development of butyl over the years has made possible truly basic research in rubber chemistry. Natural rubber and styrene rubber have countless places in their chemical structure where over-vulcanization and other side reactions can occur. Because of this chemical complexity, it had never before been possible to determine exactly how much sulfur was needed to produce the best possible rubber. Butyl, however, has a relatively simple molecular set-up and chemists have been able to analyze it accurately and to learn the answer to such puzzles and much about the behavior of any rubberlike material.

Discussing the research which led to butyl's use in industry and home today, Dr. Sparks recalled there was once a time when tire technologists said: "Butyl won't bounce; therefore, it will not be possible to make a good tire out of butyl."

This turned out to be erroneous. Dr. Sparks observed that natural rubber does bounce. The higher the tire pressure, the better the bounce. This, of course, makes for bouncier car riding. The tire manufacturers thus started designing tires for lower and lower pressures so they would bounce less and less.

Dr. Sparks, co-inventor of butyl, made comments on the technical aspects of rubber behavior as one of eight appearances he is making before scientific societies and other organizations in Italy, Germany, France, Sweden and England.

The American chemist holds the company's senior technical post, having been appointed this year to the new position of scientific advisor. His responsibilities include liaison with scentific societies, universities, institutes and similar groups.



► What is said to be the world's largest nylon heat treating unit has been installed at the Firestone Tire & Rubber Co., Akron, Ohio. Designed to give nylon cord special characteristics for use in production of extra high quality tires, the electronically controlled tensioning and gum-dipping machine contain 20 fans, 16 heaters and 14 drive motors. More than 90 feet tall, it impregnates nylon cord with a chemical solution, then stretches it and tempers it in powerful ovens.

► Adhesive Products Corp. has announced the development of "Flok-Grip", a new flame-resistant adhesive suitable for display and decorative purposes.

Firestone Petrochemical Center Opened

► The Firestone Petrochemical Center, a unit for the production of butadiene for synthetic rubber, was officially opened on Monday, November 18, in ceremonies which were attended by the firm's board of directors and 200 persons, including state and city officials and prominent industrialists. Harvey S. Firestone, Jr., chairman and chief executive officer of the company, officially opened the new unit. The Firestone Petrochemical Center was completed and put into operation as part of a concentrated new construction program and produces one of the two basic ingredients for the manufacture of synthetic rubber. The plant opening was part of a three day program during which the company's board visited plants at Orange, Texas; Lake Charles, La., and Memphis, Tenn.

Giant Coral Tires Tested

► Firestone Tire & Rubber Co., Akron, Ohio, has presented the largest synthetic tires ever manufactured to the U. S. Army Ordnance for testing purposes. Four huge experimental tires, size 24.00-25, were turned over to the Army. Two are of 100 per cent Coral rubber and two have Coral rubber bodies with treads of ordinary synthetic. Each is more than six feet tall and weighs half a ton. Last year successful tests were conducted by the army with similar Firestone tires of a smaller size. After testing, the army announced that Coral rubber tires "met or exceeded all military requirements". The development of Coral rubber was the result of work by a team of chemists, physicists and rubber technologists privately financed by Firestone.

Federal Trade Commission Issues Advertising Standards For Tires

► A set of guides for tire advertising has been issued by the Federal Trade Commission, marking a major shift in plans to carry out Federal fair trade practice regulations. The shift, from enforcement to voluntary compliance, reflects the commission's aim to improve advertising standards by giving advertisers a clear idea of what is considered the border line between fair and unfair presentation of products.

In a ten-point guide on "truthful and meaningful" tire advertising, the commission said that buyers have a right to know what quality tires they are purchasing, especially in view of today's faster and heavier cars.

Technically, the guides were prepared for members of the commission staff concerned with tire advertising. However, copies of the proposed guides have been distributed throughout the industry with an invitation to tire makers, dealers and others for comments and suggestions.

The commission hopes that within a few months a "final version" of the guides, having the endorsement and support of most of the industry, may be put into use. Widespread industry support would hold promise of voluntary compliance and of lightening the burden of complaints and enforcement procedures.

The plan is said to reflect the belief of John W. Gwynne, commission chairman, and other commissioners, that more is to be gained from cooperation and self-discipline within business and industry than from complaints against offenders. More guides for other industries are being prepared and may be expected in the near future.

The ideas of guides, or "standards," was tried out once before. A set of proposals outlining the commission's views on fair cigarette advertising was issued three years ago and has been in effect since. However, the commission only recently decided to bring other industries into the guide program.

Cites Lack of Standards

Charles E. Grandey, director of the commission's Bureau of Consultation, said the agency was taking a special interest in tire making and selling now because there appeared to be no standards in the industry for some terms in wide use. He listed "first line," "100 level" or "120 level" and "original equipments." All, he said were terms used to describe tires that fell short of the quality such names implied.

Mr. Grandey said the public spent more than $2,000,000,000 a year in tires and truthful advertising and labeling had become a matter of "increasing concern" to the commission. "Industry [must] avoid the use of terminology which in any way might be understood as implying either that such standards do exist or that particular industry products are in conformance with them," he said.

The guide says the commission plans to prohibit designations for various grades of tires that would lead buyers to believe such tires were equal or better than superior grades made by the same manufacturer. "No tire advertising or labeling should be used which implies that a tire conforms to a standard of construction when no such standard exists," said the guide.

Officials explained that failure to comply with a guide would not necessarily bring on a formal complaint against the offender. However, it is a warning that he would be "treading on dangerous ground."

Zina A. Wise, Jr.

Norman J. Johnson

Johnson Named Griffith President

► Norman J. Johnson has been named president of Griffith Rubber Mills, Portland, Ore., succeeding Zina A. Wise, president of the firm from 1951 until his death last September 19. The directors also named Zina A. Wise, Jr., son of the late president to serve as vice-president. Mr. Johnson has been with Griffith Rubber Mills for 15 years. He was assistant treasurer from 1947 to 1951, when he became treasurer and assistant general manager of the firm. In 1954 he was appointed assistant to the president, and the following year became general manager. Earlier this year he was appointed executive vice-president in addition to his position as general manager.

Zina A. Wise, Jr., has been assistant sales manager in charge of the firm's sales activities with the pulp and paper mill industry for the past two years. He will continue as head of the sales staff for pulp and paper mill industrial products in addition to serving as vice-president. He was formerly manager of sales activities of the firm's specialty line of rubber marine accessories, and has been employed in various manufacturing and management positions by the firm for more than ten years.

Huber Introduces Zeolex 23

► J. M. Huber Corp., New York, N. Y., has announced the development of a new spray-dried white reinforcing pigment for sole and heel stocks and light-colored mechanicals, called "Zeolex 23." Manufactured by a new production method, the new type Zeolex comes in tiny pellets which make it less bulky and easier to handle. According to the company, compact unit loads save more than 20 per cent space in shipping and storage. Spray-dried Zeolex 23 is said to be less dusty and freer flowing.

New York Elastomer Course

► The New York Rubber Group has announced that it will sponsor a fifteen lecture course in "Advanced Elastomer Technology" beginning Tuesday, February 18, 1958. Subsequent lectures will be held on Monday evenings at the Engineering Societies Building, 29 West 39th St., from 7:30 to 9:45 P.M. Because of limited facilities, registration has been limited to the first 200 applications received. Applications for registration will be mailed to the membership during January. Non-members may obtain registration forms by writing to L. C. Komar, Titanium Pigment Corp., 99 Hudson St., New York 13, N. Y. Mr. Komar is chairman of the Educational Committee of the New York Rubber Group. Lectures will deal with high polymer chemistry (characteristics of rubberlike materials; molecular structure; characterization, synthesis and mechanical behavior of high polymers; vulcanization and reinforcement), new polymers, physics of color and compounding, fabrication many phases of the rubber industry.

Tubeless Patent Awarded After Long Legal Battle

► A tubeless tire patent has been awarded to Frank A. Howard, retired vice-president of the Standard Oil Co. (N.J.), thus ending a legal battle begun in 1949. The original application was filed with the Patent Office in 1949, but its issuance was delayed by interference proceedings in the Patent Office with four other applications, including two filed by major tire companies. The newly issued patent, No. 2,811,189, has not been assigned on Patent Office records, but is under contract of sale to a "major tire manufacturer." (EDITOR'S NOTE: It is believed that the patent is under contract of sale to Goodyear and the tire so-produced known as the "Captive-Aire").

The newly patented casing contains an inner "tire" so that in the event of a failure in the outer casing, the driver can continue his trip. The inner tire in the Howard invention is called the "omega ring" because in cross-section it resembles the Greek capital letter omega. Its edges are gripped tightly between the edges of the outer tire and the rim.

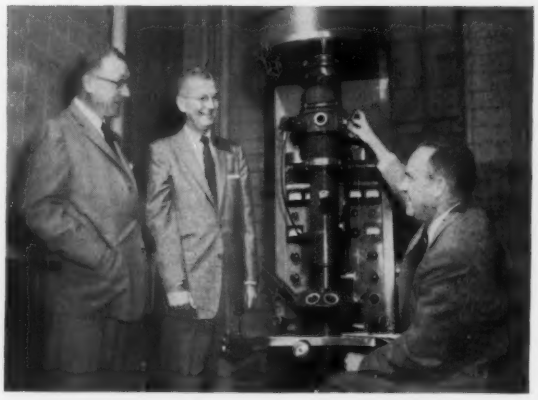
It is Mr. Howard's opinion that the new tire will eliminate the spare tire. As a matter of fact, a few 1957 model station wagons were factory equipped with the new casing, and no spares were supplied. According to trade reports, the tires will be used on at least three station wagons and five sedan models in 1958. The spare will be omitted, at least on the station wagons.

This is Mr. Howard's ninety-second patent. Most of his earlier patents relate to the oil industry and are owned by the Esso Research and Engineering Co., research subsidiary of the Standard Oil Co. (N. J.). Mr. Howard organized the subsidiary, then called the Standard Oil Development Co. in 1920, and remained its operating head until his retirement in 1945.

Silicone Sponge Compounds

► Silicone Products Department of the General Electric Co., Waterford, N. Y., has added two new compounds to the company's standard product line. The compounds are expected to make possible the production of silicone rubber sponge components to close tolerances. Designated "SE-546" and "SE-547", the compounds are said to meet the requirements of the new AMS specifications for silicone sponge. SE-546 meets the requirements of AMS 3196 for firm closed cell sponge, and SE-547, the requirements of AMS 3195 for medium closed cell sponge. Both are usable at temperatures ranging from — 120°F. to + 500°F. The company claims that these compounds provide resistance to ozone and weathering and have superior vibration damping and compression set properties. They are said to form uniform, unicellular sponge and can be made in a variety of shapes. They also have good electrical, thermal and physical properties and give excellent performance at both high and low temperatures, the company states.

Goodyear Presents Electron Microscope To Institute of Rubber Research



Dr. Maurice Morton (right), director of the University of Akron Institute of Rubber Research, explains details of department plans for the electron microscope presented to the Institute by the Goodyear Tire & Rubber Co. His audience, left to right: Dr. R. P. Dinsmore, vice-president, Goodyear research and development, and University President Dr. Norman P. Auburn.

► Presentation of an electron microscope to the Institute of Rubber Research at the University of Akron, by the Goodyear Tire & Rubber Co. has been announced by University President Dr. Norman P. Auburn. Dr. Auburn said the microscope will be used by the Institute of Rubber Research to expand its experimental and educational programs in rubber chemistry and other associated fields.

Dr. R. P. Dinsmore, vice-president in charge of Goodyear research and development, describes the unit given to the university as a tested instrument formerly used by the Goodyear Research Division. He says the microscope has the capacity of magnifying a particle up to 100,000 times its normal size for photographic or visual study. Housed in Knight Hall, the university's chemistry center, the electron microscope is being put to immediate use in measuring the particle size of synthetic rubber latex, according to Dr. Maurice Morton, director of the Institute of Rubber Research. In addition, he said the instrument undoubtedly will be used later for many other research and educational purposes which present themselves, such as the viewing of viruses or other submicroscopic species.

Hazell Named Sales Manager

► Organic Chemicals Division of the American Cyanamid Co., New York, N. Y., has announced the appointment of T. E. Hazell, Jr., as sales manager of the Intermediates Department. A native of New Jersey, Mr. Hazell is a graduate of the University of Florida. During World War II, he served as a captain in the U. S. Army and joined Cyanamid upon his release from service in 1946. Since then, Mr. Hazell has held numerous sales and purchasing posts with the company. He is a member of the Chemical Marketing and Economics Group of the American Chemical Society.

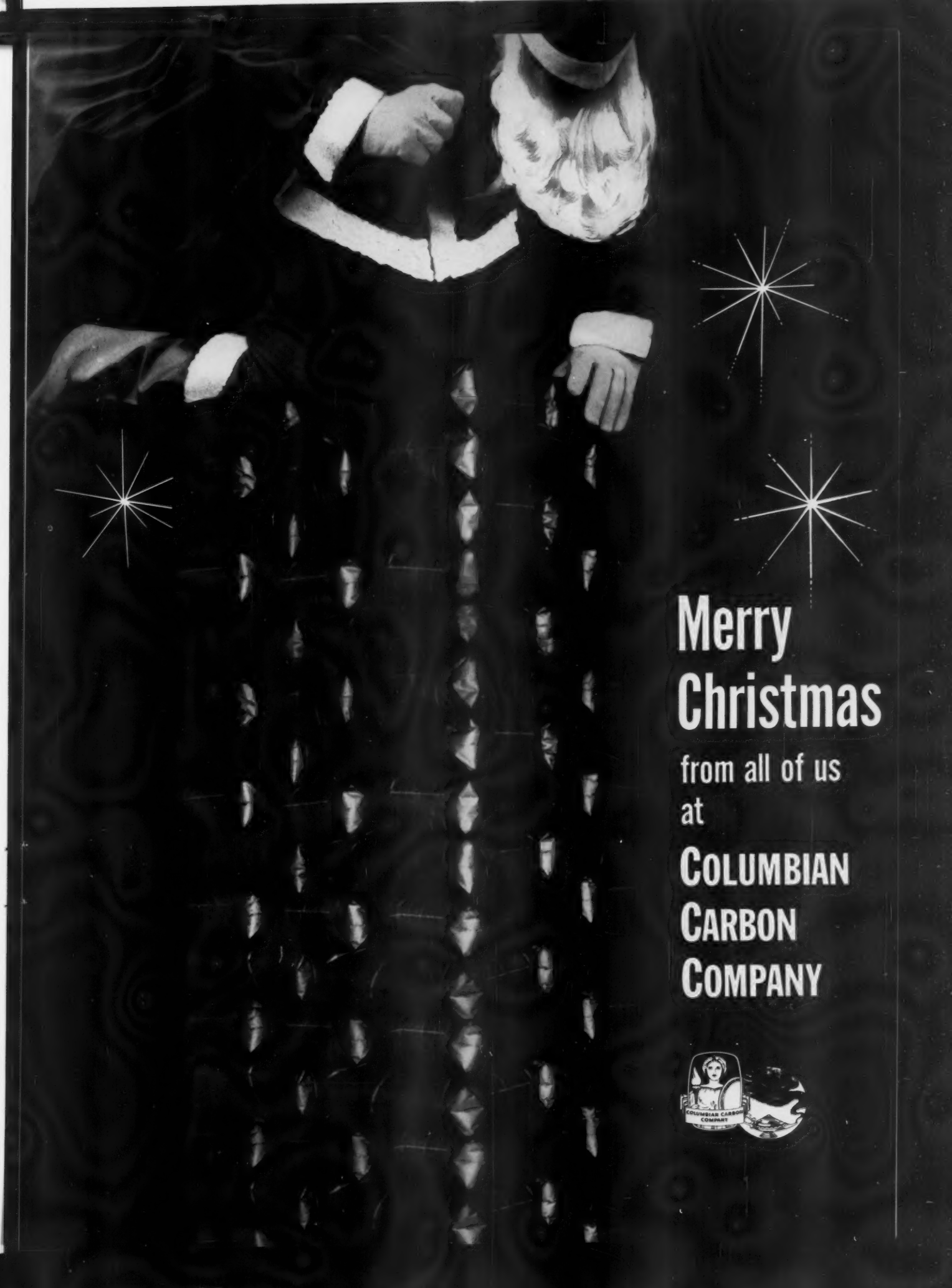
RuBARS Compounding Agent

► "RuBARS", a new type and form of compounding agent has been introduced by the DuBois Co., Inc., Cincinnati, Ohio. The new product, used in low percentages in mechanical and other mold and extrusion stocks, is reported to bring about a much cleaner and easier mold release and also to cut sharply to consumption of mold spray. Described as blond-pale, it may be used in even very light stocks, the company claims. The new product is supplied in 2.5 pound units, readily divisible for sizing to formula requirements and packed in clean, rubber-safe lined cartons.

Wing-Stay T Antioxidant

► "Wing-Stay T", a new non-staining, non-discoloring rubber antioxidant designed to meet the rubber industry's need for a higher activity antioxidant, has been developed by the Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio. A hindered phenol, Wing-Stay T provides excellent stability for compounded natural, styrene-butadiene and nitrile rubbers the company states. It forms stable, non-hydrolizable emulsions that successfully check heat, light and oxygen degradation and discoloration and is particularly effective against sunlight aging.

Elaborate laboratory tests revealed that a compounded rubber sample stabilized with the new antioxidant exhibited excellent window aging properties for a period of 12 weeks, whereas samples stabilized with two other antioxidants began to crack following exposure of four to six weeks. Similarly, after aging for 18 days in a 50°C. oxygen bomb under 150 psi pressure, Wing-Stay T samples showed more than 81 per cent tensile retention, while figures of zero and 26 were obtained for the other two antioxidants. Antioxidant activity of Wing-Stay T is superior to any non-staining antioxidant currently available in the same price range. Higher activity of the new Goodyear product suggests its use in white sidewall tires, surgical gloves, rubber flooring, etc.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Goodyear Boosts Capacity At Akron Latex Facility

► Goodyear Tire & Rubber Co. has announced completion of new production facilities which will boost the rated capacity of its synthetic latex plant at Akron, Ohio, to 27,500 tons annually. The new facilities are said to have cost $2.75 million. Originally opened in 1942, the installation, built and operated by Goodyear for the government, was the first of the nation's synthetic rubber plants to go into full production. With this 50 per cent increase in capacity, it becomes the world's largest synthetic plant devoted exclusively to the production of high solids latex.

The expanded facilities, coupled with Goodyear's Houston, Texas plant which currently is producing dry type synthetic rubber at the rate of 220,000 tons annually, move Goodyear to the front as the world's largest producer of synthetic rubber, company officials said. Combined capacity of the two plants now is 247,500 tons annually. Since purchase of both the Houston and Akron plants from the government in April, 1955, Goodyear has more than doubled its production of synthetic rubber from an original rate of 115,000 tons a year. A $10 million expansion was completed at the Houston plant in May of this year.

One of the main features of the Akron plant expansion is the addition of 10 reactors, each with a capacity of 3,750 gallons. In addition, a new recovery area consisting of two butadiene and two styrene recovery columns were constructed to handle the increased production. Latex storage facilities, which have been increased more than 200 per cent, form another important part of the expansion.

Operation of such a plant requires tremendous amount of water and new pumping facilities are capable of circulating 20,000 gallons a minute or 28 million gallons a day. Only 720,000 gallons of new water per day are required, however, as water is returned to giant towers and cooled for re-use. Originally engaged in the production of dry type synthetic rubber, the plant was converted to latex production in 1952. Just recently, the plant pioneered and successfully developed a system for continuous polymerization of high solids latex, the only synthetic plant thus far able to do so.

Names New Detroit Agent

► Western Solvents & Chemicals Co., Detroit, Mich., has been appointed distributor of "Igepal" nonionic surfactants for Antara Chemicals, a Division of General Aniline & Film Corp., New York, N. Y. The appointment was made to provide customers in Detroit and eastern Michigan with more prompt and efficient service. The Igepals are used for detergency, wetting, emulsification and dispersing. Facilities have also been made available for those who desire the blending of two or more Igepal surfactants. Customers may choose to make their own bulk or drum pickups or to designate other carriers.

George E. Carlson

Robert W. Carlson

Minnesota Rubber Announces New President and Board Chairman

► George E. Carlson has been elected chairman of the board of directors of the Minnesota Rubber and Gasket Co., Minneapolis, Minn., and Robert W. Carlson, formerly vice-president and general manager, has been named president. George Carlson, who was a founder of Minnesota Rubber and Gasket Company which started business in 1946, organized and directed the firm's nation-wide sales organization and was instrumental in its successful pioneering of the injection molding process for rubber seals and precision molded rubber parts. As board chairman, Mr. Carlson will intensify his activities in the fields of administration, sales, advertising, special projects and new ventures.

Robert W. Carlson came to Minnesota Rubber in 1948 as a chemist following two and one-half years in the Air Force. He has since held positions as plant manager and general manager and, in 1950, was elected vice-president. He is a graduate of Kalamazoo College, Kalamazoo, Mich., where he majored in chemistry.

Responsibilties of the two Minnesota Rubber executives will also include direction of the company's affiliated divisions. These include Minnesota Silicone Rubber Co., Minnesota Rainbow Rubber Co., Minnesota Latex Rubber Co., A-P-D Co., a research and development organization and Master Tool, Inc., production tool and die division.

Produces Pure Coal Chemicals

► Jones & Laughlin Steel Corp., Pittsburgh, Penna., has announced the production of pure coal chemicals at a new plant in Aliquippa, Penna. The plant has started production of high grade benzene, toluene and xylene. A light oil which contains these components is produced from the coking of coal to make metallurgical coke for the blast furnaces at the company's three steelmaking plants in Pittsburgh, Aliquippa and Cleveland. According to the company, the purity of these products exceeds the requirements of standard specifications of the chemical and allied industries. The new plant has a rated capacity of 55,000 gallons per day of light oil. At a cost of more than $2,000,000, it combines the "Hydrofining" and "Udex" processes which have been adapted to coal chemical purification.

A major feature of the company's new refining process is the ability to separate the benzene, toluene and xylene as high-purity products without making intermediate materials. This is accomplished by automatic control of highly-instrumented distillation equipment. The Hydrofining unit, which removes sulfur compounds and promotes other desirable chemical reactions, is licensed from Esso Research and Engineering Co., New York, N. Y. The Udex process, which removes the aromatic hydrocarbons from the light oil, is licensed from Universal Oil Products Co., Des Plaines, Ill.

Washington Installs Officers

► The October 16th meeting of the Washington Rubber Group, held at the Touchdown Club in Washington, D.C., featured the installation of officers for the new season. The newly elected officers are: *President*, Douglas K. Bonn (U.S. Rubber); *Vice-President*, Robert D. Stiehler (NBS); *Secretary*, Arthur W. Sloan (Atlantic Research); *Treasurer*, George W. Flanagan (Goodrich Chemical).

Bakelite Promotions Announced

► Bakelite Co., New York, N. Y., has appointed J. A. Bruton as general superintendent, E. A. Haine as services superintendent and W. A. Gay as production superintendent at the Bound Brook, N. J., plant. Mr. Bruton joined the Union Carbide organization in 1941 with the National Carbon Co., Cleveland, Ohio, and was transferred to Bakelite's Bound Brook plant later that year. During 1944 and 1945, Mr. Bruton was assigned to the Manhattan District atomic project and in 1947, he was appointed assistant superintendent at the Ottawa, Ill., plant of the Bakelite Co. He returned to Bound Brook in 1955 as assistant superintendent in charge of vinyl and polyethylene operations. In 1956, he was promoted to production superintendent.

Mr. Haine joined Bakelite in 1936 at Bound Brook. He served as an Army lieutenant colonel during World War II, returning to Bound Brook in 1946 as assistant to the industrial relations director. In 1947, he was promoted to assistant superintendent for industrial relations, in 1952, to assistant superintendent for phenolic molding materials production and in 1956, to superintendent for Vinylite and polyethylene production.

Mr. Gay joined Union Carbide in 1940 with National Carbon in Cleveland. He became associated with Bakelite's Bound Brook plant in 1941, taking a leave during World War II, when he served in Europe as a captain of field artillery. In 1946, he returned to Bound Brook and was named assistant department head of the Vinyl and Polyethylene Division in 1949. He became assistant superintendent of that division in 1953. Mr. Gay was transferred to the Polystyrene Division in 1955 as assistant superintendent and was advanced to services superintendent of the division later the same year.

Dietze Named Sales Manager

► John H. Dietze has been named central regional sales manager for the Pigments Division of American Cyanamid Co., New York, N. Y. To be headquartered in Chicago, Ill., he succeeds Kenneth A. Coate, who has been transferred to a sales assignment in Los Angeles, Calif. Mr. Dietze, a native of New Jersey, has been with the company since 1947, when he was graduated from Yale University. Formerly manager of export sales development for the Pigments Division, he has held numerous field sales posts with the firm.

Parker-Hannifin Common Offered

► Common stock of Parker-Hannifin Corp. has been offered publicly by an underwriting group headed by Kidder, Peabody & Co. The group has offered 100,000 shares of $1 par value common stock at $20 a share, current reports say. Net proceeds will be used to repay obligations incurred in the purchase of the common stock of Hannifin Corp. by the former Parker Appliance Corp. The present name was adopted September 30.

Allen M. Browne

Browne Joins RUBBER AGE

► Allen M. Browne, formerly associated with a New York advertising agency as an assistant account executive, has joined the staff of RUBBER AGE as an advertising sales representative. A veteran of Korean service, Mr. Browne attended St. Lawrence University, Canton, N. Y. In addition to his activities in the advertising field, which have involved such matters as the preparation of copy, market research projects, etc., Mr. Browne has also had experience in radio news writing, special events and announcing.

New ASTM Standards Released

► The American Society for Testing Materials has released the 1957 edition of *ASTM Standards on Electrical Insulating Materials*, which reflects an upsurge in the use of electrical power that has created a demand for new and better insulating materials. The new publication, keeping abreast of current industrial developments, contains extensive revisions and new standards. It provides an up-to-date compilation of ASTM test procedures and specifications for electrical insulation. The test methods are widely used for evaluation of potential new or improved insulating materials and for related research and development investigations. The specifications provide the consumer with a basis for purchase of insulating materials of known quality. There are 35 standard methods, 32 tentative methods and 17 specifications in this book. Of these, 15 are new or recently revised. Also included is a suggested liquid displacement method for dielectric constant and dissipations factor of polyethylene. The 6 x 9 inch volume is priced at $6.00 and consists of 692 pages. Write to American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Penna.

Patents Insulex Process

► A patented process for insulating and cushioning leather footwear called "Insulex," has been developed by the Royal Worcester Shoe Co., Worcester, Mass. The purpose of insulated footwear is to maintain the feet at body temperature at all times and to provide extra comfort. The Insulex process involves the use of a layer of Firestone Foamex between the upper and the leather lining of the shoe, and the use of this same foam rubber under the foot. This completely surrounds the foot in porous foam, which is said to provide insulation and at the same time permit circulation of air. In addition to maintaining body temperature, insulated footwear is said to be exceptionally comfortable.

The Insulex process was designed to provide for cushioning in every portion of the shoe. This cushioning feature eliminates chafing and blistering; allows the shoe to expand as the foot swells during the course of the day, and provides additional support because the shoes can be laced tightly without cutting off circulation, the company says. Many leading shoe manufacturers are licensed to use the Insulex process and a complete range of insulated boots and shoes are now generally available. The process has been used in sportswear and can now be incorporated into many year-round shoes.

Wyatt's Plastics Builds New Unit

► Wyatt's Plastics, Inc., Houston, Texas, has expanded its manufacturing facilities with the construction of a plant at Wallis, Texas, 37 miles west of Houston. Operations at Wallis will not be restricted to rubber, however, production of custom molded rubber products and rubber sheet stock will comprise a major part of the plant's activities. Facilities at the new plant will also permit increased output through a new line of combination rubber and plastic parts. These combinations are now in production for services in oil well drilling activity. Units recently put into operation include a large rubber mixing mill, a calender of producing rubber sheeting and a tuber for extruding rubber stock. The plant has the usual complement of smaller machines as well as a 1200-ton press with large platen area. Additional equipment will be added as required.

Sun Oil Develops Circasol NS

► Sun Oil Co., Philadelphia, Penna., has introduced a pale, non-volatile naphthenic type oil, specifically developed for use as an oil-extender in the manufacture of extremely light-colored butadiene-styrene polymers. "Circasol NS" is said to combine excellent non-staining and color stability in the finished rubber product with the good over-all processing qualities associated with naphthenic oils. It can be used to extend butadiene-styrene polymers 1703, 1707 and 1708 for light colored mechanical goods, toys, belting, floor tile, shoe soles, coded wire insulation, white side walls and automotive trim, the company claims.

Akron Synthetic Facility Purchased by Firestone

► The synthetic rubber pilot plant and laboratory at Akron, Ohio, owned by the government since 1944, has been purchased by the Firestone Tire & Rubber Co. and will be integrated into the company's synthetic rubber operations. The purchase includes a two story building and six acres of land located adjacent to Firestone's headquarters buildings in Akron. Approval for the sale came from three government agencies, the General Services Administration, which conducted the bidding; the Budget Bureau, which handled price clearances; and the Attorney General's office.

Firestone sold the original parcel of land to the government-operated Defense Plants Corporation on May 9, 1944. The laboratory and pilot plant was used during World War II to develop much needed synthetic rubber for the defense effort. The laboratory was operated by the University of Akron until June 30, 1956, for the study of synthetics. It was then declared unnecessary for continued government use. Part of the equipment now in the research laboratory will be used to further the application of new synthetic rubbers.

Firestone has two other synthetic facilities that once belonged to the government. It bought a 30,000 ton capacity plant in Akron and a 90,000 ton capacity plant in Lake Charles, Louisiana, in 1955. Production at the two plants has been increased from 120,000 tons a year to 230,000 tons since they were purchased by the company.

Sodium Hydride Available

► Callery Chemical Co., Pittsburgh, Penna., has announced that sodium hydride (NaH) is now available in production quantities. A highly reactive solid, this product is manufactured in mineral oil dispersions, which makes it possible to handle the material safely in air. Similar to sodium, sodium hydride may be more or less vigorous. It maintains a more reactive surface than sodium and is a weaker reducing agent at ordinary temperatures. The company has compiled "Technical Bulletin C-410", which includes complete physical properties, chemical properties, organic reactions, handling and storage procedures and summarizes suggestions for the use of this product. Write Callery Chemical Co., 411 Seventh Ave., Pittsburgh, Penna.

Gro-Cord Promotes Two

► Gro-Cord Rubber Co., Lima, Ohio, has named Don J. Paul and E. L. Babcock to new executive positions. The two men will fill the top positions in the Gro-Cord Sales Department. Mr. Paul, who has been with Gro-Cord for the past four years, has been named sales manager. Mr. Babcock, a veteran of several years in bottom stock sales, will take over as sales promotion manager of Gro-Cord, in addition to continuing field sales activities.

L. E. Gigax F. B. Shaw

Wooster Rubber Promotes Two

► Two major promotions in the Wooster Rubber Co., Wooster, Ohio, have been announced by James R. Caldwell, president and general manager. Forrest B. Shaw has been promoted to vice-president and assistant general manager, and L. E. Gigax has been named factory manager. Prior to their new positions, Mr. Shaw had been vice-president in charge of manufacturing, and Mr. Gigax had been assistant factory manager.

Mr. Shaw joined Wooster Rubber in 1945, after a 20-year association with the Goodyear Tire and Rubber Co. at Akron in production work. Upon coming with the Wooster organization, he was made production manager, and later, factory manager. Mr. Gigax, a graduate of Purdue University, was formerly associated with General Electric Co. at its Niles, Ohio, plant in production planning work before joining Wooster six years ago. He served successively as assistant plant engineer, chief industrial engineer and assistant factory manager before receiving his latest promotion.

Dunlop High Speed Tire

► Dunlop Tire & Rubber Corp., Buffalo, N. Y., has announced construction of a new high-speed tire used successfully on the auto in which Stirling Moss broke the Class F Record for 1500 cc cars when it covered a mile at 245 miles per hour at Bonneville, Utah. Dunlop engineers put to good use the knowledge gained when they designed the tires for John Cobb's World's Land Speed Record of nearly 400 miles per hour in 1947. The difference, however, was that Cobb's tire was 44 inches in diameter and for 400 miles per hour revolved at 3,000 rpm. The MG Moss used called for tires only 24 inches in diameter which at 250 mph revolved at 3,500 rpm.

While Dunlop officials are reluctant at this time to reveal further technical information regarding the tire's construction, they enthusiastically point out that their new tire licks the problems of extremely high temperatures and of the "standing wave" which, if unsolved, would have broken the tire to pieces in a few seconds during the run. They point out that during the run the MG tire was flexing 3,500 times every minute.

New Process for Vinyl Acetate

► Dewey and Almy Chemical Co., Cambridge, Mass., has announced the development of a process for producing emulsifier-free vinyl acetate polymers and copolymers, which is said to effect the virtual elimination of water spotting in vinyl emulsion paint films. In what has been termed a "breakthrough", company chemists have polymerized vinyl acetates without using emulsifiers and without detriment to the emulsions. Until now, an emulsifier was a necessary ingredient in polymerization of vinyl acetate polymers and copolymers. Dewey and Almy has termed the method for making the new emulsions as the "Q" Process, which the company says, provides high water resistance, improved wet adhesion, improved pigment binding power and greater resistance to wet rub-off. The firm plans to make "Q" Process counterparts available for many of its existing vinyl acetate Darex polymers and Everflex copolymers. The "Q" Process emulsions were devised specifically to improve latex paints based on vinyl but are also expected to be useful in paper coatings, textile finishes and adhesives.

Polypropylene Plant on Stream

► What is said to be the world's largest commercial plant to produce polypropylene, the most significant new plastic to be developed in years, went on stream December 1, according to an announcement by the Hercules Powder Co., Wilmington, Del. The plant, which is located at Parlin, N. J., is the first commercial polypropylene plant in North America, and will have an annual capacity of 20,000,000 pounds. While demand for this new product will be very heavy, Hercules officials are confident that after the usual plant shakedown, adequate quantities will be available for introductory distribution after the first of the year. The introductory price will be 65 cents per pound, but it is expected that over the long term, as large-scale operating economies are realized, the price will be fully competitive with other plastic materials. Hercules polypropylene, known as Pro-fax, is made from a petroleum by-product, propylene gas. It is unique among plastics in that it possesses a wider range of outstanding properties than any single plastic yet developed, and has lower specific gravity than any other commercial plastic material.

Opens Technical Service Laboratory

► Chemical Division of the Borden Co. has announced that the Resins and Chemical Department has opened a new technical service laboratory in Fayetteville, N. C., to provide Borden's southern customers with fast service on gluing problems. The laboratory will conduct continuing tests on plywood, particle board and adhesive performance in specific construction application. It will also evaluate new Borden products and participate in the development of special products. W. W. Johnson will head the new laboratory. Mr. Johnson, who previously served for two years in the Wood Products Section of Borden's Bainbridge laboratory, holds a B.S. degree in forestry from Purdue University and a master's degree from the College of Forestry, State University of New York.

Acquiring Isotope Products

► Curtiss-Wright Corp., Woodridge, N. J., has entered into an agreement to acquire about 80 per cent of the outstanding capital stock of Isotope Products, Ltd., Oakville, Ont., Canada, in exchange for the outstanding stock of its present wholly-owned subsidiary, Curtiss-Wright of Canada, Ltd., according to current reports. Shareholders of Isotope Products are being asked to approve issuance of 3,000,000 shares to the Curtiss-Wright Corp.; to increase the authorized capital stock of Isotope Products from 2,000,000 to 5,000,000 shares, and to consider certain changes in the capital structure. The present deficit in earned surplus and certain intangibles would be written off and the name of the company changed to Canadian Curtiss-Wright Ltd., if the various proposals are approved.

R. Scotton Griffin

DuPont Promotes Griffin

► R. Scotton Griffin, formerly sales representative in the Eastern District, has been promoted to assistant manager of the Akron District for the Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Mr. Griffin succeeds W. Newlin Keen, who has been transferred to the Elastomer Laboratory in Wilmington. A chemical engineering graduate of Cornell University, Mr. Griffin joined DuPont in May, 1946, as a compounder in the rubber laboratory where he was assigned to the wire and cable, footwear and drug sundries group. In 1950, Mr. Griffin was moved to the Elastomer sales office in Wilmington and was assigned to the sales promotion group. Later, he became a sales correspondent. He was transferred to Boston in 1951 as a technical sales representative and was moved to the Eastern District in 1955. Mr. Griffin is a member of the Rubber Division of the American Chemical Society.

Bulletins On Maglite Line

► Merck & Co., Inc., Rahway, N. J., has announced the availability of three new customer service bulletins pertaining to the use of Maglite D and Maglite K in butyl rubber. Bulletin 5704-A, *Maglite K in Butyl White Sidewalls,* deals with studies on the formulation of white sidewalls with Maglite K. According to the bulletin, use of Maglite K helps to eliminate problems of tack and stickiness. Bulletin 5705-A, entitled *Maglite D and Maglite K in Butyl as Activators in Heat Resistant Compounds,* covers Maglite D or K. These materials, it is said, can be used to advantage as activators in place of zinc oxide in the red lead curing system for butyl stocks, where electrical properties, heat resistance, weather aging or ozone resistance are of particular importance. Bulletin 5706-A, *Maglite D in Butyl as a Retarder in Heat Resistant Compounds,* describes laboratory tests which show Maglite D to be an effective retarder in a typical heat resistant butyl compound utilizing the red lead curing system with 3.0, 1.0 and 0.5 phr. sulfur.

Dedicates Glasgow Tire Factory

► Goodyear Tire & Rubber Co., Akron, Ohio, recently held dedication ceremonies for the company's newest foreign plant in Glasgow, Scotland. The factory represents a multi-million dollar investment and is the twenty-third Goodyear production unit outside the United States. Located on a 58 acre plot of land near the Glasgow city limits, the new facility is of modern straight line tire production design, with raw materials entering at one end and the finished product coming out at the other. Plant area is 250,000 square feet, consisting of the main factory building, which is 1100 feet long and 125 feet wide, and a power plant, machine shop, sub-station and cement house. Capacity of the Glasgow plant will be 1,200 tires a day, divided about equally between passenger and truck tires, and employment will be approximately 360. The new unit will be operated under the direction of Goodyear Great Britain. M. S. MacDonald, formerly division superintendent of Goodyear's California plant, is plant manager and W. H. Campbell, of the Akron Development Department, has been named technical superintendent.

Woods Named Plant Engineer

► Charles L. Woods, Jr., has been named plant engineer for the Louisville, Ky., plant of the B. F. Goodrich Chemical Co. Formerly supervising engineer at the Louisville plant, Mr. Woods succeeds Russell C. Grover, who has been appointed plant engineer for the company's new Henry, Ill., plant, which is now under construction. Mr. Woods joined the firm as a technical man at Louisville in May, 1946. He became a senior chemical engineer in January, 1952 and general foreman of the Geon polyvinyl chloride facility in June, 1954. He assumed the duties of supervising engineer in February of this year. A native of Cynthiana, Ky., Mr. Woods was graduated from the University of Kentucky in 1941 with a B. S. degree in industrial chemistry. He is a member of the American Institute of Chemical Engineers and Alpha Chi Sigma, professional chemistry fraternity.

Connecticut Hears Szulik

► The November 15th meeting of the Connecticut Rubber Group held at Manero's Restaurant in Orange, Conn., featured an address by S. Szulik, technical manager of the Golf Ball Division, Acushnet Process Co., on "How Golf Balls are Made." Mr. Szulik traced the history of the game of golf and the gradual development of the golf ball as we know it today. In tracing specifications and the general construction of the golf ball, the author took his audience through a step-by-step analysis of the manner in which golf balls are produced, discussing production of the center, freezing of the center, winding, and the application of cover stock. He also touched upon finishing operations and quality control.

Philadelphia Hears Munn; Elects Officers for 1958

► Approximately 140 members and guests of the Philadelphia Rubber Group attended the meeting held on October 25th at the Poor Richard Club in Philadelphia, Penna. Featured speaker of the meeting was J. P. Munn of the Elastomers Laboratory, Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., who spoke on "Adiprene C in Mechanical Goods." The meeting also featured an election of officers and directors for the new season. Members elected to office include:

Chairman, R. A. Garrett (Armstrong Cork); *Vice-Chairman*, R. S. Graff (DuPont), *Secretary-Treasurer*, H. C. Remsberg (Carlisle Tire). J. M. Jones (Goodyear) and Merrill Smith (American Biltrite) were elected directors. It was announced at the meeting that a total of 85 new members had joined the group during 1957.

In his address, Mr. Munn stated that Adiprene C urethane rubber represents a significant advance in the field of isocyanate chemistry. Unlike previous dry vulcanizable urethane rubbers, he stated, Adiprene C is stable and can be cured with sulfur and rubber accelerators. Reinforcing fillers are required for the development of optimum properties and those carbon blacks and mineral fillers normally employed with other elastomers may be used for this purpose. Plasticization can best be effected with coumarone-indene resins or certain esters, he declared.

Handling Compounded Stocks

The speaker noted that compounded stocks handle very well on conventional factory equipment and can be calendered and extruded smoothly and easily. Vulcanization is accomplished under the same conditions employed with other elastomers.

Adiprene C vulcanizates possess a high degree of abrasion resistance which makes this elastomer of special interest in tires as well as in many mechanical goods applications. Properly compounded vulcanizates also have excellent low temperature characteristics and are resistant to degradation by heat, ozone, weathering and nuclear radiation, he pointed out. The vulcanizates are not readily attacked by solvents or oils, Mr. Munn added.

While still in the development stage, Mr. Munn said, Adiprene C is currently being evaluated in such products as conveyor belt covers, solid tires, soles and heels, rolls, hose tubes, and a host of miscellaneous molded products. Commercial application has already started in a number of these fields, the author disclosed.

► Typical properties and reactions of 2,5-dihydroxybenzoquinone are described in a technical data report released by Eastman Chemical Products, Inc., Kingsport, Tenn., a subsidiary of Eastman Kodak Co.

New Bonding Process Permits Joining of Polyethylene to Rubber

► Bell Telephone Laboratories, New York, N. Y., has announced the development of a process to bond polyethylene directly to rubber, brass or brass-plated metals. An adhesive said to be many times stronger than any currently used for this purpose makes it possible to achieve a lasting bond between polyethylene and brass or natural and some synthetic rubbers.

Based on a synthetic material known as "partly hydrogenated polybutadiene," the adhesive is so strong it will resist a pull of approximately one thousand pounds per square inch, much greater than present day pressure-sensitive adhesives. The application of the polybutadiene product as an adhesive and the physical processes necessary to make this possible are the work of Henry Peters of Bell Laboratories' Chemical Research Department. The bonding is accomplished with heat ranging from 250 to 350°F., and pressures of one hundred pounds per square inch or less, although higher temperatures and pressures may be used. The process may be extended to plastics related to polyethylene, Bell Laboratories states.

The new bonding process developed at Bell Telephone Laboratories makes use of partly hydrogenated polybutadiene, known commercially as "Hydropol", which is manufactured by the Phillips Petroleum Co. of Bartlesville, Okla. Any degree of unsaturation of the polybutadiene between three per cent and thirty per cent gives the best bonds. Various materials are added to the Hydropol to make it capable of vulcanization.

By using the Hydropol mixture as a bonding agent excellent bonds can be made between polyethylene and brass or brass-plated metals, and between polyethylene and neoprene, natural rubber, or styrene rubber. Apparently, Bell Laboratories officials state, the hydrogenated polybutadiene adheres to the polyethylene because of its similar chemical structure and thermoplastic properties. The bond to a vulcanizable rubber is probably due to the formation of sulfur crosslinks at the interface that occur during the vulcanizing process.

A layer of bonding agent two to three mils thick is desirable for proper adhesion. The agent may be made up in a solution and sprayed, brushed, or dipped to provide the desired layer, or a thin sheet can be fabricated and inserted between the materials to be bonded.

Peel strengths up to one hundred pounds per inch and tensile strengths of one thousand pounds per square inch can be readily achieved. These values are considerably higher than have been possible with previously available techniques, officials of the Bell Laboratories declared.

► The small white wafer that Henry Peters of Bell Telephone Laboratories is pointing to with the pencil is a super-strong adhesive. Brass, polyethylene plastic and rubber can be successfully joined together, for the first time, by a new adhesive process developed by Mr. Peters. In the model shown here, the top layer is brass. It is joined to polyethylene which is bonded to rubber which is then joined to the bottom layer of brass. The entire "sandwich" is held in a huge machine for testing the bond strength. The adhesive will resist a pull of approximately one thousand pounds per square inch. It would take a pull of about two thousand pounds to break the bonding in this model since its surface area is almost two square inches.

New Alkyl Chlorides Available

► Henley & Co., Inc., New York, N. Y., has introduced a new group of alkyl chlorides for evaluation in the rubber industry. They are 1-chlorododecane, tech.; 1-chlorotetradecane; 1-chlorohexadecane, tech.; 1-chloroktadecane, tech.; and 1-chloreicosane, tech. The products listed are available in ton lots. Pamphlets and specifications are available from Henley & Co., Inc., 27 Spruce St., New York 38, N. Y.

Rubber Processing Aids Offered

► Tennessee Products and Chemical Corp., Nashville, Tenn., has announced full production and immediate availability of benzoguanamine, an organic chemical said to be adaptable for a wide variety of uses in rubber processing. The company has also announced that it is now producing benzonitrile in commercial quantities. Benzonitrile, a basic chemical used in the production of zenzoguanimine, is adaptable for many other uses.

Names in the News

Joseph L. Pert, who has been with the company since 1951, has been appointed sales manager of Ensolite and Ensolex, cellular plastic materials, for the Footwear and General Products Division of the U. S. Rubber Co.

William S. Leonhardt, former budget director, has been named treasurer of the Commercial Solvents Corp., succeeding **Howard L. Sanders,** who has become president of Northwest Nitro-Chemicals, Ltd., a Canadian affiliate of the company.

Richard D. Rice has been appointed manager of rubber and polymer operations while **Harold W. LeBoeuf** has been named manager of intermediates operations for the Silicone Products Department of the General Electric Co.

Clarence C. Campbell, who formerly managed the Foam Rubber Laboratory for Collins & Aikman Corp., has been appointed manager of textile chemicals for the Pennsylvania Industrial Chemical Corp.

Raymond P. Russell, formerly Boston district manager of the B. F. Goodrich Industrial Products Co., has been appointed assistant sales manager of the B. F. Goodrich Flooring Co.

Glenn A. Mellinger, previously assistant sales manager — general sales, has been promoted to sales manager—general sales, for the Ohio Rubber Co., a division of the Eagle-Picher Co.

Frederick Machlin, president of the Armstrong Rubber Co., was among 50 top New England executives honored at the "Dateline Boston" Ad Club luncheon, which was co-sponsored by the Advertising Club of Boston and the Lantern Club of New England as a salute to New England industry by the American publishers.

C. Walter Carlson, previously a sales engineer on special projects, has been appointed container products field sales manager for the Footwear and General Products Division of the U. S. Rubber Co.

General Hermon F. Safford, president of the Ohio Rubber Co., was named "National Management Man of the Year" and presented with a citation plaque at the 34th National Conference of the National Management Association.

George J. Stritch, who was previously with the B. F. Goodrich Co., has been named Detroit representative for the Tire Yarn Division of American Viscose Corp.

Dr. Hugh Stott Taylor, dean of the graduate school of Princeton University, has been named by the Franklin Institute of the State of Pennsylvania to receive the Franklin Medal for his contributions to the science of physical chemistry, particularly his development of the theory of heterogeneous catalysis.

John H. Scherer, previously sales manager of the Can Division of the Crown Cork and Seal Co., has been named vice-president and director of marketing and sales by the Thermoid Co.

Harvey S. Firestone, Jr., sailed recently on the Queen Elizabeth on a tour in order to inspect his company's factories and sales operations in France, England, Spain, Switzerland and Germany.

Werner G. Holzbock, formerly chief development engineer, has been appointed chief engineer for the Askania Regulator Co. He has been succeeded in his former post by **James Kogen.**

James S. Rankin, previously chief purchasing agent of Dunlop Canada, Ltd., was honored at a recent testimonial dinner at the Engineers Club on his retirement after 51 years with the company.

Richard W. Stickney, who has had 11 years experience in commercial research and marketing in the industrial field, has been appointed manager of commercial research for Hewitt-Robins, Inc.

James L. Killian, Jr., formerly senior technical manager at the B. F. Goodrich associated plant in Enschede, Holland, has been appointed manager of technical services in Europe for the International B. F. Goodrich Co.

Elmer J. Collins, retired U. S. Army Colonel who has held key positions in both industrial and military areas, has been appointed product development engineer for the Marbon Chemical Division of the Borg-Warner Corp.

William D. Gohr, who has had more than 33 years experience, has been appointed sales manager for air springs for the Firestone Industrial Products Co.

Harold H. Radke, previously development supervisor at the Development Center of the B. F. Goodrich Chemical Co., has been named development program analyst, a newly-created position which was established to assist in the selection of research and development projects.

Paul A. McNulty, formerly technical advisor to the assistant of the president of Boston Woven Hose and Rubber Co., has been named administrative assistant for Tracerlab, Inc.

Frederick L. Bissinger, previously vice-president in charge of research, has been elected to the newly created post of group vice-president of marketing and research for the Industrial Rayon Corp.

David R. Eagleson, who has been on the sales staff of Emery Industries, Inc., since 1945, has been promoted to assistant sales manager of the Fatty Acid Sales Department and will be succeeded by **Paul N. Leech** as sales representative in the Chicago area.

Carl Woodrow Hansen, who formerly served in the X-Ray Division of the General Electric Co., has been appointed chief engineer in the Industrial Products Division of Tracerlab, Inc.

Joseph R. Augello, previously a sales representative with the Washine Chemical Corp., has joined the Purchasing Department of the Witco Chemical Co.

Jack L. Shafer, formerly general sales manager of the Plastics Division of the Curtiss-Wright Corp., has been appointed vice-president in charge of the newly expanded Sales Department for Tensolite Insulated Wire Co., Inc.

Karl A. Dalsky has been promoted from manager of commercial tire sales to manager of commercial products and development for the General Tire & Rubber Co.

Thomas J. Campbell, who has had 20 years of film and home-office experience with Nopco and Metasap products, has been named assistant to **O. E. Lohrke,** sales manager for Metasap Chemical Co.

Orville W. B'Hymer, formerly assistant to the sales manager, has been promoted to the newly created position of customer service manager for the Fatty Acid Sales Department of Emery Industries, Inc.

Arthur F. Noyes, who wrote the first manual on changing from solid to pneumatic truck tires for the B. F. Goodrich Tire Co., was recently presented with a wristwatch in observance of his 30th anniversary with the company.

Roger S. Firestone, president of Firestone Plastics Co., has been re-elected president of the United Cerebral Palsy Association, Inc.

Dr. Carl Shipp Marvel, research professor of organic chemistry at the University of Illinois and World War II leader in the development of synthetic rubber and antimalarial drugs, has been named national chairman of the American Chemical Society's $3 million building fund campaign.

Donald R. Caskie, treasurer for the Firestone Tire & Rubber Co. of Canada, Ltd., and C. D. Waggoner, controller at the Gates Rubber Co., have been elected to membership in the Controllers Institute of America.

Philip Morris To Buy Two Firms

► The board of directors of Philip Morris, Inc. has approved in principle the acquisition of Franklin Research Co., Philadelphia, Penna., and Polymer Industries, Inc., Springdale, Conn. This is a part of the company's diversification program which began on July 2, 1957 with the acquisition of Milprint, Inc. Philip Morris believes that through its advanced technology and unique product development, Polymer Industries holds a position of acknowledged leadership in the packaging and paper converting branch of the industrial adhesive field. Franklin Research is considered a major factor in the production of waxes, polishes, cleaners, industrial emulsions and finishes. Discussing the new acquisitions, O. Parker McComas, president of Philip Morris said, "the actions are directly in line with the company's long range plan of extending logically its corporate activities through a policy of diversification." Both Franklin Research Co. and Polymer Industries, Inc. have approved the acquisition in principle. Upon completion of details of the acquisitions both companies will operate under present managements as separate, autonomous units of Philip Morris. Philip Morris plans to coordinate the research and development efforts of the two companies.

Hi-Miler Xtra Grip Tire

► A special service truck tire has been developed by the Goodyear Tire & Rubber Co., Akron, Ohio, which is considered to be a 35 per cent improvement over a predecessor line of mud and snow tires. Called the "Hi-Miler Xtra Grip", the tire features a continuous center rib joined to double-ribbed diagonal bars for added traction; self-cleaning open shoulders, and a broader, flatter tread to curb swaying and weaving. Designed to provide long, even wear in the tread, exact positioning of tread lugs tone down noise and make the tire smoother running. The width and flatness of the tread put more rubber on the road, thereby improving the tire's starting and stopping ability and its resistance to skid, the company says. Goodyear claims that test records compiled during in-use evaluations of the tire, indicate that the new tire gives as much as 35 per cent better traction in mud and snow and a 30-40 per cent increase in mileage. The Hi-Miler Xtra Grip is available in tubeless or tube-type construction. Built with Goodyear 3-T cord, with most sizes available in nylon construction, the tire comes in sizes 6.00-16 through 10.00-22 tube-type, and 6.00-16 through 11-24.5 tubeless.

Named Executive Vice-President

► Worthington Ball Co., Elyria, Ohio, has announced the election of Robert F. Smith as executive vice-president of the company. Mr. Smith will have authority over sales, production, engineering, research and development and over the operations and affairs of the company under the general supervision of the president.

Bruce R. Silver

Retires From N. J. Zinc

► Bruce R. Silver, technical assistant to the vice-president, retired on November 1, after more than 35 years service with the New Jersey Zinc Co. He started his employment with the company in 1922 as a sales engineer, becoming district sales manager in charge of the Cleveland office in 1927. He served for over 20 years as manager of technical service and in 1953 was appointed technical assistant to the vice-president. One of the most widely-known men in the pigment consuming industries, particularly the rubber industry, Mr. Silver was responsible for many contributions to pigment development and application, chief among which was his work on colloidal and propionic-treated zinc oxides.

As an associate of Thomas A. Edison during World War I, Mr. Silver was active in many technical programs for the U. S. Navy, notably in submarine detection and the development of camouflage techniques. He remained a close personal friend of Mr. Edison for many years.

Mr. Silver was Austin Teaching Fellow in Chemistry at Harvard from 1916 to 1918 following his graduation from New York University. He served as Chairman of the Visiting Committee of the University College and President of Arts & Engineering Alumni Association of New York University. He received the Medallion Award from that institution for "service to Alma Mata". He has also been prominent in the university's fund-raising activities for a long period. His fraternities are Delta Upsilon and Alpha Chi Sigma.

In 1935, he was Chairman of the New York Rubber Group. He is also a member of A.S.T.M., A.A.A.S., S.C.I., Institution of the Rubber Industry (London) and the Chemists' Club.

► The John Price Wetherill Medal of the Franklin Institute of the State of Pennsylvania has been awarded to the Martin Co., Baltimore, Md., "In recognition of the intensive research, development and manufacture of bonded structures."

Rubber Floor Design Contest

► A designer's award of $1,500 and an installer's award of $500 are being offered as top prizes in the 1957 Rubber Floor Design Awards competition which will close on Dec. 31, 1957. Sponsored by the Rubber Flooring Division of the Rubber Manufacturers Association, Inc., the competition is open to architects, decorators, and installers in business within the continental United States. The award will be given to the designer whose entry is judged the best-designed rubber floor installed in a commercial or institutional building during 1957. The installer of this design award winning floor will receive the $500 installer's award.

Judges for the competition are Leon Chatelain, Jr., president of the American Institute of Architects; Marc T. Nielsen, former president of the American Institute of Decorators, and John Knox Shear, editor-in-chief of *Architectural Record*. Complete rules of the competition and official entry sheets may be obtained from Rubber Floor Design Awards Committee, the Rubber Manufacturers Association, Inc., 44 Madison Avenue, New York 22, N.Y.

Valvair Laboratory Completed

► Valvair Corp., Akron, Ohio, has completed a new product development and testing laboratory as part of an over-all expansion program. Equipped with the latest testing and measuring devices, the new laboratory provides means for determining dynamic characteristics of all types of valves and for establishing the engineering soundness of new designs. Testing facilities provide for high or low pressure air and vacuum tests; air and liquid flow metering plus electrical testing; testing of pressures, velocities, acceleration and position, 2-pressure systems; determination of CV values and pressure drop and elevated temperature testing. The new laboratory includes an endurance test room and electronic equipment includes a special oscilloscope for measuring high speed phenomena. Commercially available test stands were not sufficiently versatile to meet Valvair's requirements, the manufacturer says, and much of the new equipment was designed, developed and custom-assembled by or for the company.

New Nopco Representative

► The Industrial Division of the Nopco Chemical Co. has announced the appointment of William F. Dolan, Jr. as technical sales representative in North Carolina and the eastern part of Tennesse. Mr. Dolan, a graduate of Alabama Polytechnic Institute, has been with Nopco's Textile Chemicals Division since 1955. He is a member of Phi Psi, Tau Beta Pi, and Sigma Nu fracternities. In his new position, Mr. Dolan will be handling sales of Nopco's complete line of processing chemicals including such products as esters, ethylene oxide condensates, amides, metallic soaps, sulfonates, water soluble polymers, and resin and wax emulsions.

Cyanamid Announces Two Appointments

► Organic Chemicals Division of the American Cyanamid Co., New York, N. Y., has announced the appointment of J. G. Affleck as manager and R. W. McCullough as sales manager of the Rubber Chemicals Department. Dr. Affleck, a graduate of Princeton University, joined the company in 1949 as a chemist at the Stamford, Conn. laboratories. He has served since 1955 as manager of Cyanamid's New Product Development Department. He is a member of the American Chemical Society. Mr. McCullough, who was graduated from the Case Institute of Technology in Cleveland, Ohio, has been with the firm since 1950, when he served as a sales representative in the Cleveland office. Early this year, he was named manager of technical services for the Rubber Chemicals Department. He is a member of the Rubber Division of the American Chemical Society, Alpha Chi Sigma (professional chemists' fraternity) and many local rubber groups throughout the country.

Viton A Coated Fabrics

► Fabrics Division of E. I du Pont de Nemours & Co., Inc., Wilmington, Del., has announced that fabrics coated with a new synthetic rubber, "Viton A" fluoroelastomer, are now available for testing. The new synthetic rubber is said to possess remarkable resistance to deterioration by heat, chemicals, aircraft and automotive fuels as well as lubricants. An addition to the line of Fairprene elastomer coated fabrics, the new material will withstand total immersion in most fluids at temperatures of about 300°F. Viton A coated fabrics are almost impervious to ozone and weathering, the company says. Three Fairprene coated fabrics made with Viton A are offered: coating of Viton A on glass fabric, coating of Viton A on fabrics of Dacron polyester fiber and coating of Viton A on glass fabric coated with Teflon tetrafluoroethylene. The material is supplied fully vulcanized in 36-inch widths. Manufacture and sales of the material for testing purposes will be limited for a time.

Kralastic HTHT Plastic Pipe

► "Kralastic HTHT", a new plastic material which is believed to be a major step toward the development of a plastic hot water pipe, has been developed by the U. S. Rubber Co. According to the company, the new material retained its shape in tests in which it carried low-pressure steam and water heated up to the boiling point. Conventional pipe plastics were distorted in the same tests. The new material is said to combine the toughness of synthetic rubber with the mechanical strength of plastic. Advantages of plastic pipe are that hot water would be kept hot for longer periods because plastic is a better insulator than metal; a plastic cold water line would sweat less on humid days and there would be no rust or corrosion. Initial cost would be roughly a third less than copper and the cost of installation would also be lower because plastic pipe can be joined with sleeve-type fittings and solvent cement. Although further work will be necessary before the new material is ready for the home plumbing pipe market, a more immediate use is in radiant heating pipes. Industry is also testing the new plastic for pipe used to carry hot acids and in molded parts exposed to high heat.

Giant Tires in Regular Production at Firestone

► Three-year-old Vicki Veller is awed at the sight of what is said to be the world's largest regular production tire during a visit to the Firestone Tire & Rubber Co., where her mother works. The giant tire, size 36.00-41, is more than nine feet tall. It contains 1,763 pounds of natural rubber, 418 pounds of fabric and more than five miles of beadwire. It is a tubeless tire for off-the-highway use and weighs a total of 3,355 pounds.

Nellen Elected To Lee Board

► Lee Rubber & Tire Corp., Conshohoken, Penna., has announced the election of Arthur H. Nellen to the board of directors to fill the vacancy caused by the death of George S. Mahanna. Mr. Nellen is vice-president in charge of development and research for Lee Rubber, including its Republic Rubber Division at Youngstown, Ohio. He is a 1917 graduate of Penn State College, where he was elected to the honorary scholastic society Phi Kappa Phi. He is a member of the American Chemical Society; the Franklin Institute of Philadelphia; the American Society for the Testing of Materials and was chairman of the New York City Group, Rubber Division, American Chemical Society in 1938 and 1939. Mr. Nellen was chairman of the Technical Advisory Committee, National Synthetic Rubber Corp., from 1942-44. He served as a member of the Executive Committee of the Copolymer Corp. from 1952-1954 and as a member of the board. During World War II, Mr. Nellen was appointed to the War Production Board and placed in charge of the Division of the Rubber Director's Office for the conversion of the tire industry from natural to synthetic rubber. During the same period, he was in charge of all government sponsored tire testing.

Goodrich Silvertown 125 Tire

► Development of a new high-speed tubeless passenger tire said to provide maximum safety at top turnpike speeds and yet give long wear at regular speeds has been announced by the B. F. Goodrich Tire Co., Akron, Ohio. According to the company president, E. F. Tomlinson, the combination of safety at high speeds and long wear at normal speeds is unique in the tire industry. Named "Silvertown 125", the new tire has six nylon plies. The nylon cord construction is said to resist some of the main causes of tire failure such as road shock and heat build-up in tires run at high speeds. The Silvertown 125 has Super V cord angle construction and the same tread depth found in standard tires. The cord body of the tire is protected from the dangers of severe impact by a patented butyl inner liner, which device is said to change a bruise blowout to a slowout.

Tire Consulting Firm Formed

► A new firm, Mitchell Enterprises, Inc., 1925 Taft Drive, Lakewood (Denver), Colo., has been formed to offer a consultation service on tire purchasing and usage to commercial concerns using fleets of vehicles. The company is believed to be the first of its kind in the country. The firm is headed by Lee W. Mitchell, former manager of tire research and development at the Gates Rubber Co. Isaac (Sax) Willson, Denver attorney, has been designated secretary-treasurer. Mr. Mitchell believes that many companies employing fleet operations desire and need specific expert assistance in getting the most out of the money they invest in tires. He said, "The aim of the new company is to counsel with companies on tire problems such as purchasing methods, types and care of tires and record systems for cost accounting."

Thiokol Plans Stock Split

► Directors of the Thiokol Chemical Corp., Trenton, N. J., have declared a five per cent stock dividend on the common, and proposed a 2-for-1 split, according to current reports. The dividend was payable on November 20 to holders of record October 20. The split, if approved by stockholders, will be made January 22 to holders of record January 8.

Cyanamid Promotions Announced

► Hugh Puckett, former manager of the Specialty Products Department, has been named director of sales for the Organic Chemicals Division of the American Cyanamid Co., New York, N. Y. R. W. Daniels, who was previously manager of the Intermediates Department, has been appointed assistant director of sales. Both men will be headquartered at the Bound Brook, N. J., plant. Mr. Puckett has been with Cyanamid since 1937, when he joined the firm as assistant southern sales manager. He later served as southern sales manager, then as southern district manager for the Industrial Chemicals Division. Since 1953, he has been manager of the Specialty Products Department of the Organic Chemicals Division. Mr. Puckett is a member of the American Chemical Society and the American Association of Textile Colorists and Chemists. Mr. Daniels has been associated with Cyanamid since 1936, when he was graduated from Dartmouth College. Formerly manager of the Intermediates Department of the Organic Chemicals Division, he has served the company in various other sales and managerial posts. He is a member of the American Chemical Society and the Synthetic Organic Chemical Manufacturers Association.

Radiation Synthesis Studied

► Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., has released a recent Navy study of elastomers produced by irradiation of polyvinyl methyl ether, entitled *The Irradiation of Polyvinyl Methyl Ether with Electrons and Gamma Rays to Form Elastomers.* Report PB 131003 gives details of a study in which polyvinyl methyl ether and mixtures of the ether with a variety of powdered fillers were irradiated with electrons from a Van de Graaff electron accelerator and gamma rays from cobalt-60. Although the ether crosslinked, fillers were necessary to give products with much strength, the report states. Ordinary chemical methods of crosslinking, or vulcanization, were ineffective. Elastomers were obtained with tensile strengths of over 1500 psi and elongations at breaking of 100 to 200 per cent. Some exceeded silicones and thiokols in strength. Product strength was as high as that obtained in limited tests of radiation vulcanization of natural and synthetic rubbers. Radiation doses were about the same, or 40 megaroentgens. The report includes radiation synthesis procedures. The 35 page volume is priced at $1.

Rhodia Odor-Control Chemicals

► Rhodia, Inc., New York, N. Y., has introduced four new Alamask odor-control chemicals for use in latex rubber formulations for molded and dipped goods. The new Alamasks were developed to withstand high temperature processing and to abate odorous formulation chemicals and to impart a pleasant distinctive fragrance to the product. They may be added directly into batch formulations with suitable plasticizers or as dispersions in emulsified systems.

Produces Still-Seal Gaskets

► Stillman Rubber Co., Culver City, Calif., has announced the production of "Still-Seal Gaskets" under license from Franklin C. Wolfe Co. Leaf-proof static seals with full metal-to-metal contact, they are said to be suitable for sealing in a wide range of fluids at pressures from vacuum to more than 5000 psi and temperatures from —80°F. to 500°F. The one-piece Still-Seal Gasket eliminates the necessity for costly and difficult to close tolerances common to other static sealing methods. According to the company, the Still-Seal Gasket offers the following advantages: no cold flow either at time of application or from vibration during use; no loss of sealing effectiveness from action of fluid being sealed; assurance of structural integrity because of full metal-to-metal contact; light weight; simple installation; seals both high and low pressures or vacuum; economical to use and re-usable. The Still-Seal Gasket is available in AN 763 flange patterns or special patterns as desired. The company offers special application engineering service to assist designers in overcoming sealing problems.

Angier Expands Sales Staff

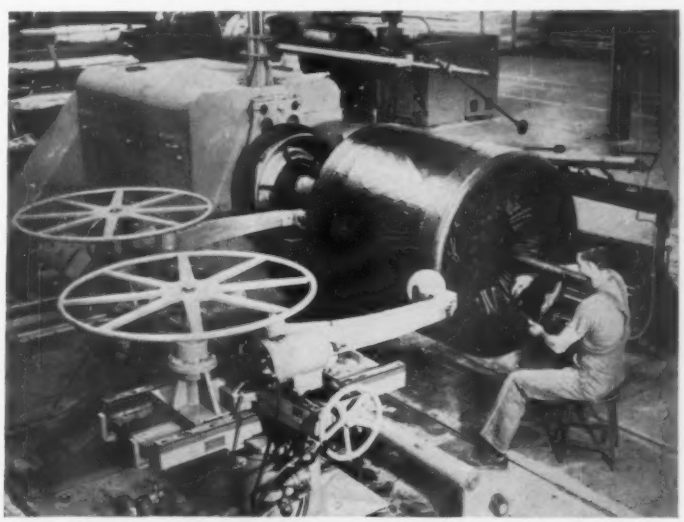
► Angier Adhesives, a division of Interchemical Corp. at Cambridge, Mass., has announced that Howard Ellerhorst, Jr., has joined the newly expanded sales staff as vice-president and director of sales. Harrison F. Rowbotham has been named vice-president in charge of sales promotion and George Beesley has been appointed vice-president of finance. Mr. Ellerhorst has had 15 years experience in the Finishes Division of Interchemical Corp. as well as important liaison with Interchemical's divisions and customers.

Cabot Promotes Rossman

► Godfrey L. Cabot, Inc., Boston, Mass., has announced the appointment of Raymond P. Rossman as director of its newly-formed Carbon Black Technical Department. A 1934 graduate of South Dakota State School of Mines and Technology with a B. S. degree in chemical engineering, Mr. Rossman completed his master's degree in physical chemistry at Massachusetts Institute of Technology in 1936. He worked as research assistant in the Electrical Engineering Department of MIT before joining Cabot in 1937. Mr. Rossman started work in the company's Boston laboratory in the Physical Research Section. Later, he became group leader of the laboratory's Rubber Division. In 1944, he was appointed manager of Cabot's Southwestern rubber testing laboratories in Pampa, Texas. He was assigned to the Technical Department in 1949 as liaison representative between Cabot's Production and Sales Departments. In 1952 he became assistant sales manager. In 1955 he was appointed director of the company's research and development laboratories in Cambridge, Mass. As director of the new Carbon Black Technical Department, Mr. Rossman will continue to have his headquarters at the Cambridge laboratories.

Studies Plastics Plant Site

► Shell Chemical Corp., has announced that it is studying the possibility of constructing a multi-million dollar plastics plant in Burlington County, N. J. The firm is surveying a 200 acre site between the Delaware River and U. S. Route 130, southwest of Riverside, N. J., to check the suitability of the area for a synthetic resins and plastics plant and for other associated processing units. The land is owned by Swarthmore College.



► This tire building machine used to manufacture giant off-the-road tires at the B. F. Goodrich Tire Company's new off-the-road tire plant in Miami, Okla., is believed the largest of its kind in the world. Tires weighing up to 3000 pounds, for use in highway and airport construction, are now beng produced in the new plant.

Financial News

Union Asbestos

► Nine months to September 30: Net income of $572,888, which is equal to $1.20 per share, compared with a net loss of $207,078 in the first nine months of 1956. Sales in the 1957 nine month period totaled $9,916,993, compared with $9,428,-174 a year earlier. The 1957 net income figure includes nonrecurring profit of $96,274, or 20 cents a share, from condemnation of property. Loss in 1956 reflects a net loss after provision of $257,000 for loss on liquidation of heating and cooling divisions.

B. F. Goodrich

► Nine months to September 30: Net income of $30,254,077, which is equal to $3.38 per comon share, compared with $30,667,340, or $3.44, a share, for the first nine months of 1956. Sales in the first nine months of 1957 totaled $560,-802,565, compared with $538,646,156 in the same period of 1956.

Goodyear Tire

► Nine months to September 30: Net income of $51,621,653, which is equal to $4.98 a common share, compared with $45,349,415, or $4.37 a share, a year earlier. Sales in the first nine months of this year totaled $1,082,499,729, compared with $1,010,571,802 in the same period last year.

Hewitt-Robins

► Nine months to September 30: Net income of $862,816, which is equal to $2.09 a common share, compared with $785,346, or $1.88 per share, a year earlier. Sales in the first nine months of this year totaled $41,405,500, compared with $38,907,286 in the corresponding period of the preceding year.

U. S. Rubber

► Nine months to September 30: Net income of $22,982,452, which is equal to $3.40 a common share, compared with $23,453,685, or $3.54 a share, in the same period last year. Sales in the first nine months of 1957 totaled $665,360,840, compared with $657,147,998 in the 1956 nine month period.

Anaconda Wire & Cable

► Nine months ended September 30: Net income of $4,315,712, which is equal to $5.11 per share, compared with $7,220,-330, or $8.55 a share, in the same period last year.

O'Sullivan Rubber

► Nine months ended September 30: Net income of $87,313 compared with a net loss of $73,379.

Barry Controls

► Nine months to September 30: Net income of $143,935, which is equal to 48c a share, compared with $169,945, or 57c a share, in the first nine months last year. Sales in the 1957 nine month period totaled $3,486,299, compared with $3,384,-953, in the corresponding period of the preceding year.

Mansfield Tire & Rubber

► Nine months to September 30: Net income of $1,109,380, which is equal to $1.82 a common share, compared with $1,113,359, or $1.82 a share, in the 1956 nine month period. Sales in the first nine months of 1957 totaled $46,611,529 compared with $48,039,443, in the corresponding period last year.

Minnesota Mining & Manufacturing

► Nine months ended September 30: Net income of $29,625,485, which is equal to $1.75 a share, compared with $27,202,398, or $1.61 a share a year earlier. Sales in the 1957 nine month period totaled $274,-225,317 compared with $235,948,905 in the corresponding period last year.

Amerace

► Nine months to September 30: Net income of $1,140,259, which is equal to $1.80 a common share, compared with $890,098, or $1.34 a share, in the corresponding nine months last year. Sales in the first nine months of 1957 totaled $39,-216,592, compared with $42,933,141 in the same period last year.

Thermoid

► Nine months to September 30: Net income of $1,128,294, which is equal to $1.26 a common share, compared with $1,318,599, or $1.47 a share in the first nine months of 1956. Sales in the first nine months of 1957 totaled $29,970,948 compared with $38,071,657 in the same period last year.

Flintkote

► Nine months to September 30: Net income of $4,717,091, which is equal to $2.54 a common share, compared with $5,284,804, or $3.10 a share, in the 1956 nine month period. Sales in the first nine months of 1957 totaled $89,306,462, compared with $86,498,672 in the same period last year.

Columbian Carbon

► Nine months to September 30: Net income of $3,395,812, which is equal to $2.11 a share, compared with $4,328,010, or $2.68, a share, in the corresponding months of 1956. Sales in the first nine months of 1957 totaled $52,609,534 compared with $47,941,030 a year earlier.

Firestone Tire

► Nine months to July 31: Net income of $44,583,308, which is equal to $5.40 a share, compared with $42,904,733, or $5.25 a share, in the corresponding period a year ago. Net sales and other operating revenues totaled $844,603,697 in the first nine months of this year, compared with $813,750,210 in the same period in 1956.

Sheller Manufacturing

► Nine months ended September 30: Net income of $1,511,993, which is equal to $1.59 per share, compared with $826,467, or 87c per share, in the same period last year. Sales in the first nine months of 1957 totaled $31,510,379 compared with $29,337,154, in the 1956 nine month period.

Aetna-Standard Engineering

► Year to June 30: Net income of $1,418,741, which is equal to $3.07 per common share, compared with a net income of $1,298,064, in the 1956 fiscal year. Net sales and other income in the year to June 30 totaled $43,411,427, compared with $33,372,184 a year earlier.

General Cable

► Nine months ended September 30: Net income of $9,156,539, which is equal to $3.15 a common share, compared with $8,725,628, or $3.06 a share, in the same period last year. Gross profit on sales totaled $25,456,602, compared with $23,-045,476 a year ago.

Swan Rubber

► Year to July 31: Net income of $1,-003,337, which is equal to $1.35 a share, compared with $1,492,903, or $2.02 a share, in the 1956 fiscal year. Sales in the 1957 nine month period totaled $18,832,-718, compared with $19,715,687 last year.

Thiokol Chemical

► Nine months to September 30: Net income of $1,020,218, which is equal to $2.08 per share, compared with $609,-598, or $1.35 a share, in the same period last year.

McNeil Machine & Engineering

► Nine months to September 30: Net income of $2,542,363, which is equal to $4.21 a common share, compared with $2,183,877, or $3.68 a share, in the first nine months of 1956.

New Jersey Zinc

► Nine months to September 30: Net income of $1,540,566, which is equal to 79c a common share, compared with $1,499,-353, or 77c a share, in the 1956 nine month period.

U. S. Rubber Reclaiming

► Nine months to September 30: Net loss of $22,884, compared with a net income of $120,850 in the corresponding period of the preceding year.

Cabot Promotions Announced

► Godfrey L. Cabot, Inc., Boston, Mass., has announced the appointment of Dr. W. R. Smith, formerly associate director of research, as associate technical director in charge of international research liaison and consultant in fundamental carbon black research. E. M. Dannenberg, previously associate director of research, has been promoted to director of carbon black research. Dr. Smith received his B.S. degree in chemistry in 1928 and his M.S. in 1930 at the University of Massachusetts. From 1930 to 1935, he was a research associate and teaching fellow at Harvard University and received his Ph. D. in physical chemistry from Harvard in 1935. He joined Cabot the following year as chief research chemist and in 1953, he was appointed associate director of research. Dr. Smith is a member of the honorary society of Phi Kappa Phi, the American Chemical Society, the Society of Chemical Industries (London), the American Institute of Chemists and the Electron Microscope Society of America. He is a former chairman of the New England section of the American Institute of Chemists.

Mr. Dannenberg attended the Massachusetts Institute of Technology, receiving his B.S. degree in chemical engineering in 1940. From 1940 to 1943, he was a research associate at M. I. T., where he was elected a member of Sigma Xi, the honorary chemical research society. Mr. Dannenberg joined Cabot in 1945 as a research chemist in the Research and Development Department, became a group leader in 1946 and was named associate director of research in 1953. He is a member of the Rubber and Colloid Chemistry Divisions of the American Chemical Society, the American Institute of Chemistry, the Institute of the Rubber Industry (London) and the Society of Plastics Industry. Mr. Dannenberg is the author of numerous technical publications and holds patents in the fields of clay, rubber and plastics technology.

Executive Realignment Announced

► Sinclair-Collins Valve Co. and Valvair Corp. have announced changes in executive personnel. J. E. Collins, formerly president, has been elected to the newly formed post of chairman of the board. W. F. Kruspe, former executive vice-president, has been named to succeed Mr. Collins as company president and will continue as general manager. Mr. Collins was one of the founders of Sinclair-Collins Valve Co., the parent corporation. Under his leadership, the firm's line of basic high pressure valves has been expanded to include a wide variety of manually and automatically controlled valves, automated production process timers plus a full complement of small pneumatic and hydraulic control valves for medium pressures. Mr. Kruspe, who was formerly associated with Ernst & Ernst, public accountants, joined the corporation as treasurer in 1951. He was appointed executive vice-president and general manager in 1954.

St. Joseph Lead Sales Conference

► On October 28, the St. Joseph Lead Company conducted a two-day meeting for its zinc oxide sales personnel at the Pittsburgh Airport Hotel, Pittsburgh, Penna. About fifty sales representatives and technicians from the company's Josephtown, Penna., zinc smelter were present. The session was technical in nature and was conducted by St. Joseph technicians under the direction of J. J. Rankin, production engineer. On October 29, R. H. Crossley, manager of zinc oxide sales, led a discussion on sales problems. Following this, the group visited the Josephtown zinc smelter near Monaca, Penna., and inspected its various laboratories and the nearby paint test fence site. Of considerable interest to the group were St. Joe's direct reading spectrometer and electron microscope, both valuable new tools in research, development and the quality control of zinc oxides for use in the rubber, paint and ceramic industries.

Goodyear Constructs Giant Hose for Army

► Miss Lillian Napier perches prettily inside the bore of one of the largest industrial hoses ever constructed by the Goodyear Tire & Rubber Co. Destined to suck up mud and sand from the bed of the Mississippi River for the U.S. Corps of Engineers, the giant hose has an interior diameter of 38 inches and weighs 8,600 pounds. Constructed with 2,200 pounds of steel wire and covered with 3,000 pounds of rubber, the hose is 20 feet long. As a matter of comparison, Miss Napier is five feet, four inches tall, weighs 112 pounds and measures 35-22-35.

Goodrich Educational Program

► B. F. Goodrich Co., Akron, Ohio, has made tuition-sharing grants to 43 colleges and universities in 20 states under its Aid-To-Higher Education program during the last year. A total of 585 employees participated in the program from the beginning of the 1956 fall semester through the 1957 summer term. Cost-of-education grants equal to 50 per cent of tuition and laboratory fees are made to the schools attended by employees and the company also shares the cost of tuition and laboratory fees with employees. Other programs included are: 1) Gift-matching in which the company matches the amount given by employees to colleges and universities (up to $500); 2) Four-year scholarships to qualifying high school graduates selected by the National Merit Scholarship Corp.; 3) Grants to colleges and universities for designated research and development, and 4) Employment of outstanding college and university teaching and research talent for consultation on company projects.

L. A. Syndicate Buys Parco Rubber

► Parco Rubber Products Co., Houston, Texas, has been purchased by a Los Angeles syndicate headed by Laird Pierce and Byron Barnes. The company was purchased for about $150,000 from Plastic Rubber and Products Co., Los Angeles, Calif. Purchase price includes Parco's inventory and a lease that still has 11 years to run. New officers of the company are Mr. Barnes, president; Mr. Pierce, executive vice-president; Forest Brattain, vice-president and treasurer; A. T. Schwarzbach, sales manager, and J. D. McCormic, plant manager. The company's new board is composed of Mr. Pierce, Mr. Barnes, Mr. Brattain, Harry Taylor and Ira Frazier. Mr. Pierce announced that there will be no change in either personnel, policy or products of the company. He continued to say that for the first time, the company had hired a chief chemist, James Butler, who was formerly with Plastic Rubber and Products Co.

Adds Compounding Facility

► Midwest Rubber Reclaiming Co. has announced the completion of a newly constructed facility for custom compound mixing at its Barberton, Ohio, plant. The central piece of equipment is a new No. 11 Banbury mixer powered with an 800 horsepower motor, two-speed drive and a 16-inch high pressure ram with extended feed throat. A unique factor is a carbon black handling system so constructed as to return fly carbon to each batch. It is designed to permit an operator to run the Banbury relatively free of carbon black dust. Beneath the Banbury is a 26 x 26 x 84-inch mixing mill equipped with cross-blending machinery and other auxiliaries including a ribbon cutter. A batch-off machine is also provided to automatically take the finished slab of rubber from the mill, cool and convey to pallets for shipment. Storage space in the form of a new 25,000 square foot warehouse has been added.

West Coast News

► Western industry took another forward step on November 5 with the official opening in Los Angeles of a new $7½ million vulcanizing plant by the Goodyear Tire & Rubber Co. The new plant is described as the world's most fully automatic tire curing facility.

Built to meet the growing demand for tires in the West and to modernize the firm's local facilities, the new plant represents the last word in automatic methods of tire curing, according to Robert W. Maney, vice-president of the firm's Western Division. Operation of the new facility is being directed by Marshall Gillespie, Los Angeles plant manager.

As described by Mr. Gillespie, the new plant houses 88 latest-design tire-curing presses with 176 molds and is the first tire curing installation to apply automation to the loading and unloading of the intricate automatic presses.

Uncured tires from tire builders in an adjoining section of the factory are carried into the new curing plant on chain conveyors. As they move along the line of curing presses, the tires are transferred by hand to racks for temporary storage or placed on other conveyors from which they are automatically transferred to the curing molds.

When cured, tires are automatically ejected onto a conveyor system that carries them to finishing, inspection and shipping stations.

The new one-story building, 140 feet wide and 540 feet long, is connected to the south side of the main factory by a tunnel and conveyor system. A basement 140 feet wide and 440 feet long houses the more than five miles of piping required by the curing equipment.

In addition to passenger car tires, Goodyear's Los Angeles production includes tires for heavy trucks, buses and farm tractors. Other principal products include air foam rubber, airplane fuel cells, rotary hose and a wide range of other molded and extruded rubber products for use in the automotive and other industries.

Situated on a 77-acre site, the present plant is valued at over $52 million and comprises over 1½ million square feet of floor space. It produces over 130 million pounds of rubber products annually employs approximately 2800 persons and has an annual payroll of about $15 million.

► Don Benkert has been appointed manager, engineering and sales, of the newly formed Still-Seal Gasket Department at the Stillman Rubber Co., Culver City, Calif. Mr. Benkert will be responsible for directing nationwide sales and product applications on the "Still-Seal Gasket" which the company is producing under license from Franklin G. Wolfe Co. Prior to joining Stillman, Mr. Benkert was in charge of the group responsible for operation and performance of the fluid systems of missiles and drones at Radioplane Co., Van Nuys, Calif. His activities included analyses and evaluations of the systems under all anticipated conditions. Mr. Benkert, a mechanical engineering graduate of the University of Southern California, previously worked at Northrop Aircraft, Inc., on both airplane and missile projects.

► Baker Castor Oil Co. has announced the addition of A. M. "Mel" Lipscomb to its Pacific Coast sales staff. Based on Baker's Los Angeles office, Mr. Lipscomb will handle sales and technical service to the rubber, resin, plastics, paint and chemical industries in the Southern California area.

Interior view of the new 7½ million dollar tire curing plant at Goodyear's Los Angeles factory. Shown are two of the four banks of 88 tire curing presses, each with two molds. In front of each press, uncured tires may be seen on tilted conveyors which automatically feed them to the presses. Cured tires just ejected from the presses move on belt conveyors toward finishing stations.

Mr. Lipscomb received his B.S. degree in chemistry from Tulane University, New Orleans, in 1952. Prior to joining Baker, he was employed by the Western Division of Firestone Tire & Rubber Co. as an applications chemist for four years and more recently as assistant manager of quality control for the same concern.

Boston Holds Panel Meeting

► The Fall Meeting of the Boston Rubber Group held on October 18 at the Somerset Hotel in Boston, Mass., featured a panel discussion on "Reclaimed Rubber". T. H. Fitzgerald (Naugatuck Chemical) served as moderator, and the panel included John M. Ball (Midwest Rubber Reclaiming), J. E. Brothers (Ohio Rubber), W. R. Macy (Goodrich), H. D. Glenn (Naugatuck Chemical), C. Huddleston (U.S. Rubber Reclaiming) and J. E. Meisner (Xylos Rubber). Each of the panel members discussed some phase of reclaimed rubber, including its applications and potentialities, and then answered questions which had previously been submitted as well as questions from the floor. The technical portion of the meeting was followed by a dinner. The after-dinner speaker was Tom Dowd, traveling secretary of the Boston Red Sox. At the dinner meeting, the Nominating Committee proposed three names as candidates for the 1958-59 Executive Committee. Those nominated were John M. Hussey (Goodyear), Norman K. Mullin (C. K. Mullin) and Ferd Nadherny (Godfrey L. Cabot).

Thiokol Technical Bulletins

► Thiokol Chemical Corp., Trenton, N. J., has issued two new technical bulletins on butyl rubber. The first, *Bulletin 100-3*, is entitled "Evaluation of Butyl Accelerators—Quinoid Type Cure". Covering the topic in outline form, the bulletin includes several charts. The second report, *Bulletin 103*, is a "Study of the Ester-Type Low Temperature Butyl Plasticizers". This too, includes illustrative charts.

Hewitt-Robins Appointments

► Robins Engineers Division of Hewitt-Robins, Inc., Stamford, Conn., has announced several new appointments. Frank G. Hensel has been named administrative manager of the division; Jack Van Kleunen, manager of engineering sales; Douglas H. Martini, manager of engineering sales service; E. H. Fallon, contract manager, and Robert W. Taylor, chief estimating engineer of the Rock Products Department. Mr. Hensel is a graduate of the University of Pennsylvania with a B. S. degree in mechanical engineering and has served such companies as Carrier Corp., Syracuse, N. Y., and Reaction Motors, Inc., Denville, N. J. Mr. Van Kleunen started with Hewitt-Robins in 1944 as a draftsman in the Vibrating Screen Department in Passaic, N. J., and has had over 10 years' experience in engineering and sales. A graduate of Pratt Institute, where he majored in structural engineering, he also holds a degree in civil engineering from the Newark College of Engineering.

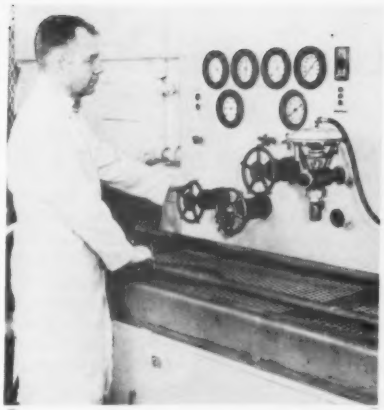
Mr. Martini joined Hewitt-Robins in 1937 as an engineering clerk, progressing to draftsman, estimator, expediter, chief project engineer and manager of engineering sales. He studied mechanical engineering at Purdue University and for one year attended night school at the Illinois Institute of Technology and Northwestern University. Mr. Fallon, who transferred from the International Division, has had over 20 years' experience in Hewitt-Robins engineering contract business. He holds a B. S. degree in mechanical engineering from Newark College of Engineering. Mr. Taylor joined Hewitt-Robins as an engineering trainee immediately after graduating from the University of West Virginia with a degree in mining engineering.

Named New England Representative

► Industrial Ovens, Inc., Cleveland, Ohio, has announced the appointment of E. W. Maass as the company's New England representative. Mr. Maass established his plastics equipment manufacturers' agency in East Hampton in 1955. Immediately prior to the formation of his agency, he served as an engineering consultant to many plastics and allied firms in New England. A chemical engineering graduate of Rensselaer Polytechnic Institute, Mr. Maass has been active in the plastics field for 25 years. He served as an engineer with the DuPont Co. and American Optical and was Plastics Division manager for National Vulcanized Fibre Co.

Riegelease G Separating Paper

► Riegel Paper Corp., New York, N. Y., has added a new release and separating paper to its line of coated, laminated and resin impregnated papers. The new product is designated as "Riegelease G" and is said to provide efficient release from most pressure sensitive adhesives, rubber and asphalt compounds and plastic resins. The firm is currently producing eight different release and separating papers.



Completes Testing Facilities

► Sinclair-Collins Valve Co., Cleveland, Ohio, has completed new design and testing laboratory facilities, equipped with what are said to be the latest types of precision measuring and evaluating devices. A part of Sinclair-Collins' expansion program, the new facilities include a high pressure air, steam, oil and hot water test room. High flow rates up to 500 gpm are available for checking steady state flow conditions on valves up to 6 in. pipe size. Dynamic hydraulic testing can be done at pressures up to 5,000 psig, at flow rates as high as 35 gpm. Various field conditions, such as controlled back pressures encountered in working cylinders, also can be simulated. In addition, simultaneous 2-pressure performance is checked on the new testing equipment. According to the manufacturer, standard commercial test stands were not sufficiently versatile to meet the company's needs. As a result, much of the new equipment has been developed, designed and custom-built by or for Sinclair-Collins.

Borden Arcco Coatings

► Chemical Division of the Borden Co., New York, N. Y., has developed three Arcco brand bond coatings specifically designed to obtain high-strength, flexible bonds of plastisol and organosol film to nylon and other synthetic fabrics. Both a one-coat and a two-coat system have been devised by Borden for successful use of its three Arcco coatings materials, which have been evaluated in the company's laboratories. Both are said to have proved themselves in limited commercial application as selected coaters. Borden points out that the one-coat system is completely practical. For more critical applications, the company recommends the two-coat system because it "gives better color, consistently higher bond values over a wider range of weave constructions, and can be fused in less time". Adhesion values for plastisol films exceed 20 pounds peel strength per 2 inch width.

Assigned to Japanese Project

► Arne Melby, previously plant manager of the Niagara Falls, N. Y. plant of the B. F. Goodrich Chemical Co., has been assigned to supervise the construction of a new associate synthetic rubber plant in Japan, which will be built by Japanese Geon, Ltd. Mr. Melby will report to Marvin W. Larson, director of associate company relations. Philip H. Lawrence, formerly manager of project engineering at the company's general offices in Cleveland, Ohio, has been appointed to succeed Mr. Melby as plant manager of the Niagara Falls plant. A native of Duluth, Minn., Mr. Melby is a 1929 graduate of Case Institute of Technology, where he received a Bachelor of Science degree in chemical engineering. He joined Goodrich in 1940 as an analytical chemist and after several assignments, he became plant manager of the Niagara Falls installation in 1946. Mr. Melby is a member of the American Institute of Chemical Engineers, American Chemical Society and the New York State Society of Professional Engineers. Mr. Lawrence attended Oklahoma A & M and was graduated from Michigan State University in 1940, receiving a Bachelor of Science degree in chemical engineering. He joined Goodrich in 1942 as technical shift foreman in the company's Louisville, Ky., plant. After serving Goodrich in several capacities, Mr. Lawrence was named manager of project engineering in 1955. He is a member of the American Chemical Society, the American Institute of Chemical Engineers and a past chairman of the Louisville section and the Cleveland Engineering Society.

Develops Fluorocarbon Compound

► Development of a fluorocarbon rubber compound that is said to show excellent resistance to many petroleum oils, synthetic lubricants, silicate esters and aircraft fuels covering a temperature range from about 50°F. to over 500°F., has been announced by the H. O. Canfield Co., Inc., Bridgeport, Conn. This type of compound, company officials said, should be of considerable advantage to applications requiring maximum resistance to deterioration by heat and functional fluids. Exhaustive laboratory and field tests are being conducted on jet aircraft engines and other mechanical devices where high temperatures are encountered during operation, it was stated.

Opens New Naval Stores Plant

► Newport Industries Co., division of Heyden Newport Chemical Corp., New York, N. Y., has announced the opening of a new $3 million naval stores plant, constructed on a 100 acre site at Telogia, Fla. Newport's fifth naval stores production unit, the new plant will have the capacity to produce thousands of tons of stump wood per month by large, continuous fractioning units, company officials state. FF grade rosin, turpentine, pine oil and dipentene will be manufactured.

Canadian News

► The resignation of J. D. Barrington as president and managing director of the Polymer Corp., Ltd., and the appointment of E. R. Rowzee to that post has been announced by E. J. Brunning, chairman of the board. Mr. Barrington resigned in order to accept the position of president and managing director of Ventures, Ltd. Mr. Brunning stated that he was pleased that Mr. Barrington would continue as a member of the board of directors of Polymer. He commented on the rapid development and progress of the company under Mr. Barrington's leadership.

Mr. Rowzee has been vice-president and manager of Polymer since 1951. A graduate of M.I.T. in chemical engineering, he has been associated with Polymer since its inception in 1942. He was one of the pioneers in the development of synthetic rubber on this continent. He came to Canada on loan to Polymer and has become a Canadian citizen. Mr. Rowzee is a past-president of the Chemical Institute of Canada and was honored with a degree of doctor of science by Laval University in 1955.

Mr. Rowzee has announced the appointment of three vice-presidents for the company. L. D. Dougan, presently plant manager, has been named vice-president—operations, Stanley Wilk, presently treasurer, has been appointed vice-president—finance, and Roger E. Hatch, now general sales manager has been appointed vice-president—marketing. These appointments are effective immediately.

Mr. Dougan has been with Polymer since September, 1944. Since that time he has been director of production, assistant manager and since 1951 to the present, has been plant manager with direct responsibility for production, industrial relations, engineering and the technical divisions. Mr. Dougan is well known in Sarnia through his activities with the Chamber of Commerce, the Sarnia General Hospital Commission, Victorian Order of Nurses and the Y.M.-Y.W.C.A. He is a graduate of the University of Toronto in chemical engineering and a member of the Association of Professional Engineers and the Chemical Institute of Canada.

Mr. Wilk is a graduate chemical engineer from the Drexel Institute of Technology in Philadelphia, his home city. He came to Polymer in 1946, having served with the Petroleum Administration for War with the U.S. Government in Washington. Since coming to Sarnia, his work has been associated with the financial operations of Polymer and he has direct responsibility for accounting, economics, traffic and purchasing. He is a member of the American Management Association, the Chemical Institute of Canada, the American Petroleum Institute, and the Association of Professional Engineers. Also well known in Sarnia, Mr. Wilk is president of the Sarnia Chamber of Commerce this year and has had association with the Victorian Order of Nurses, Boy Scout Association and other community activities.

Mr. Hatch has also been with Polymer since 1942 when he joined Canadian Synthetic Rubber, Ltd., on operational work. Mr. Hatch is a graduate in Science from Mount Allison University in Sackville, N.B. Born in France, he has lived in Canada most of his life. Since becoming manager of the Sales and Technical Service Division in 1947, Mr. Hatch has traveled extensively throughout the world developing markets for Polymer products. He is a member of the Canadian Institute of Chemistry and the American Chemical Association. In Sarnia he is past director of the Chamber of Commerce and the Rotary Club, and a member of the Sarnia Riding Club.

► Polymer Corp., Ltd., has announced that tenders for the construction of an addition to the company's Administration Building have been called. Construction is expected to commence early in 1958 contingent upon the approval of the company's capital program for 1958 which is currently under development. It is proposed that the new addition will extend one hundred feet to the south of the present building, and it is designed to permit further extension in that direction. An architectural feature will be a glass area between the new and old sections. In most other respects it will conform to the existing building, utilizing steel frame, concrete and brick materials. An entrance to the new wing is designed for the southwest corner. Heating will be provided by a forced air dual duct system. When completed, the additional floor area will provide office space for a number of departments.

► William Herbert Schmalz has been named assistant general manager of the Footwear and General Products Division, Dominion Rubber Co., Ltd. Besides his new duties at the company's executive offices in Montreal, Mr. Schmalz will continue to direct new products development and production at the Footwear and General Products Division in Kitchener. A graduate of the University of Toronto, Mr. Schmalz has been associated with Dominion Rubber for seventeen years, and has held important positions in the company, notably in the technical development and in marketing of special products.

► Pigment & Chemical Co., Ltd., Montreal, Que., sole distributors for Canadian Felling Zinc Oxide, Ltd., at Milton, Canada, has announced the availability of a new type of French Process zinc oxide. This new oxide, by a special process, is densified and pelleted following production of the regular qualities. The combination of high density and pellet form provides an oxide which incorporates and mixes more rapidly than conventional types in most compounds. Less dusting and a smaller package for easier handling and storage are additional features. The new densified-pelleted type of zinc oxide is available in all standard grades of French Process zinc oxide.

► The Eastern Canadian Branch of M. L. Snyder & Son, Ltd., including the office, manufacturing, etc., has moved from its old address at 2777-81 Dundas Street West, Toronto, to a newly built factory located at Woodbridge, Ont., about 25 miles north of Toronto. This factory will provide three times the space previously available and allow major production increases.

► The Ware Chemical Corp., Westport, Conn., has appointed Wolf B. Jonah of Lewis Specialties, Ltd., 18 Westminster Ave., North, Montreal 28, Que., as agent. He will handle Ware Chemical's line of rubber accelerator "Prespersions" and other chemical specialties to be sold to the rubber and plastic trade.

SPE Plans 14th Annual Meeting

► The fourteenth annual conference of the Society of Plastics Engineers, Inc. will be held at the Hotel Sheraton Cadillac in Detroit, Mich., January 28 to 31, 1958. The conference theme is "Progress Through Plastics Engineering" and papers will include discussions of injection molding, extrusion, new materials, automotive applications, tooling, mold design and many others. The annual luncheon and business meeting will be held on Tuesday, January 28 and a special luncheon with a prominent speaker will be held on Wednesday. The annual banquet will take place on Thursday. Registration fees for the 1958 conference are $15.00 for S. P. E. members and $20.00 for non-members. Hotel room reservations may be made by writing Housing Committee, 14th Antec—S. P. E., c/o Detroit Convention and Tourist Bureau, 626 Book Bldg., Detroit, Mich.

New Organization Formed

► A new organization, the Electrical Insulating Materials Association, is being formed to disseminate practical information about the properties and uses of electrical insulating materials. To be located in New York City, the association will provide a means of establishing better communications in the electrical and electronics industries, specifically, on the application of electrical insulating materials. At a meeting held on November 1 in New York City, 20 representatives of well known insulating materials manufacturers agreed upon the following proposal:

"Electrical Insulating Materials Association (EIMA) is an organization sponsored by manufacturers for the benefit of all users of basic electrical insulating materials. EIMA is independent of any other existing technical society or trade association and is not intended to conflict with other objectives. This organization has been formed because of the recognized need for an improved method of communication between manufacturers of electrical insulation materials and the end users.

"Its function is the dissemination of technical, product and application information of all electrical insulating materials used in the manufacture of electrical equipment. This will be carried out through the medium of national and/or local programs. Membership is not limited. The requirements for membership are that a company or individual be actively engaged in the development, manufacture or use of basic electrical insulating materials, electrical or electronic equipment. Membership is further extended to engineering and research personnel associated with the electrical industry, universities, and government agencies."

H. H. Chapman, Jr., of Owens-Corning Fiberglas Corp., was appointed chairman protem, and temporary committees on Organization, Publicity, Finance, Constitution, Programming, and Membership were selected from members of the group present at the meeting.

An industry-wide organization meeting was to have been held on December 11, 1957, in New York City, at which details of the scope, objectives and proposed organization of the association were to have been discussed. The immediate aim of EIMA is to establish a Fall, 1958, date for a national meeting at which application reports on insulating materials will be presented. Inquiries should be directed to H. H. Chapman, Jr., manager, Apparatus Insulation, Textile Products Division, Owens-Corning Fiberglas Corp., 598 Madison Avenue, New York 22, New York.

Expands Iron Gate Plant

► Virginia Rubber Corp., Clifton Forge, Va., has announced the completion of plans for new construction that will more than double the size of the company's plant at Iron Gate, Va. The addition of 60,000 square feet is scheduled for completion by the first of the year. Employment will be more than doubled, from 135 to 300 workers during the coming year.

Foam Plastics Output Up

► Production of cellular plastics in 1956 came to about 16,000,000 pounds, according to Dr. Paul G. Roach, chairman of the Cellular Plastics Division of the Society of the Plastics Industry, Inc., and executive development engineer of the U.S. Rubber Co. Production of foamed plastics from such resins as vinyl, urethane and polystyrene in 1957, is estimated at 29,000,000 pounds.

Issues New Specifications

► Department of the Navy, Bureau of Ships, Washington, D. C., has issued several new specifications. The first, *Military Specification MIL-C-21066 (SHIPS) of 2 September 1957; Coating System, Polyvinyl Chloride-Plasticizer Dispersion (Plastisol)*, is a specification for plastisol coating material which can be fused into a solid covering. This states that fused coating shall be resistant to acids, petroleum fuels and lubricants with good electrical insulation properties. Suitable adherence to mild steel, magnesium, aluminum, bronze, brass and corrosion-resisting steel and copper is required. However, different primers may be supplied to meet the latter requirement.

The second, *Military Specification MIL-C-21067 (SHIPS) of 24 October 1957; Coating Compound, Synthetic Rubber, (for) Exposed Steel Surfaces*, is for brushable or sprayable liquid rubber material which cures at room temperature. It is intended for use in protecting exposed surfaces of naval ships from corrosion. A primer may be supplied if required.

Both specifications contain a qualification clause. Awards will be made only for such materials as have been tested and approved for inclusion in the applicable qualified products lists. Two more of the Bureau of Ships visual inspection guides on various rubber products have been issued as military standards. These are: *Military Standard MIL-STD-407, Visual Inspection Guide for Rubber Molded Items* and *Military Standard MIL-STD-413, Visual Inspection Guide for Rubber O-Rings.*

R C Polyester F-1 Developed

► Rubber Corp. of America, Hicksville, N. Y., has announced the development of "R C Polyester F-1", a modified glycol-polyadipate specifically designed for reaction with di-isocyanates to produce polyurethane flexible foams and films. The new product has an acid number of 1.5 maximum and a hydroxyl number of 58-68. The viscosity (cps) at 25°F. is 10,000-13,000 and the Gardner color is 5 maximum. The material has a specific gravity of 1.195 ± 0.005 at 20/20°C., and a moisture percentage of 0.0.

Bakelite Personnel Changes

► Bakelite Co., New York, N. Y., has announced the appointment of the following product general managers: J. L. Brannon (phenolics), J. E. Brister (polyolefins), L. E. Humphrey (polystyrene), and W. R. Wheeler (vinyls). Mr. Brannon joined Bakelite in 1930 and became head of the Molding Materials and the Resin Pulverizing Departments at the Bound Brook, N. J., plant in 1942. In 1947, he advanced to assistant to the vice-president in charge of production and was appointed superintendent of Bakelite's Marietta, Ohio, plant in 1952. He was named assistant works manager of the company in 1956. Mr. Brister has been associated with the company since 1933. In 1944, he was named manager of the Wire and Cable Division and he became department manager of molding and extrusion in 1953. He was appointed product general manager (polystyrene) in 1956.

Mr. Humphrey has been with Bakelite since 1935. In 1939, he became head of the Molding Materials Department at the Bloomfield, N. J., plant and later advanced to head of the Polystyrene Department at the Bound Brook plant. In 1950, Mr. Humphrey was named assistant superintendent of the Polystyrene Department. He was named production superintendent at the Bound Brook plant in 1952 and general superintendent in 1955. Mr. Wheeler joined the Union Carbide organization in 1932 at the Union Carbide Chemicals Co. In 1941, he became associated with Bakelite and in 1946, was appointed assistant superintendent of the Bound Brook plant. He was named general superintendent in 1952, assistant works manager of Bakelite in 1955 and works manager in 1957. Mr. Wheeler received a B.S. degree in mechanical engineering from Virginia Polytechnical Institute.

New Brominated Compounds

► Michigan Chemical Corp., St. Louis, Mich., has announced a series of new brominated compounds used to impart flame-proofing and self extinguishing characteristics to plastics, protective coatings, fluids, textiles, paper and wood products where fire resistance is important. The new products are tetrabromobisphenol-A, tetrabromophthalic anhydride, tris(2-bromethyl) phosphate, pentabromophenol, and tris(2,3-dibromopropyl) phosphate. These products are said to possess the fundamental flame-proofing superiority of brominated compounds which—molecule for molecule—are several times more efficient than other chlorine analogs. This basic advantage permits the use of smaller quantities of the flame-proofing additive than would be required with chlorine compounds. As a result, there will be less disturbance of the physical properties and appearance of the end product, and less adverse effect on product utility. The possibility of brominating curing agents, monomers, and basic resins, themselves to achieve a "built-in" flame-proofness is a related phase of research and development being carried on by Michigan Chemical.

Obituaries

Thomas Robins

► Thomas Robins, founder and former chairman of Hewitt-Robins, Inc., and inventor of the heavy-duty belt conveyor, died on November 4 after an illness of several months duration. Born in Highland Falls, N. Y., Mr. Robins attended Princeton University for two years. He left Princeton in his sophomore year to become a salesman for a small New York rubber company, which is now defunct. He conceived the idea for the modern belt conveyor in 1891 and made his first sale to Thomas Edison's iron ore mine in northern New Jersey. He also invented a new type of belt roller (now called idler) that was built in the shape of a "U" to keep the ore from spilling off the sides of the belt. Mr. Robins founded the Robins Conveying Belt Co. in 1896 and in 1945, the company was merged with the Hewitt Rubber Co. to form Hewitt-Robins, Inc. From 1891 to 1898, Mr. Robins served in the Naval Reserve and during President Wilson's administration, he was secretary of the Naval Consulting Board, a group of 24 scientists, headed by Mr. Edison, who directed research on military projects including anti-submarine devices. Mr. Robins also served for a time as head of the government's Board of Inventions. At the time of his death, he was a member and former president of the Edison Pioneers, an organization formed several years ago to honor Mr. Edison. He is survived by two sons.

Franklin H. Springer

► Franklin H. Springer, chief chemist of the Davol Rubber Co., Providence, R. I., died unexpectedly at his home in Bristol, R.I., on November 20. He was 61 years old. Born in Providence, R. I., he attended the Colt Memorial High School in Bristol and later the Rhode Island State College, from which he was graduated in 1920. Mr. Springer was associated with the Davol Rubber Co. for more than 25 years. Both his education and his career were interrupted by service in both World Wars. He held the rank of a reserve colonel and was active in the affairs of Army Reserve, veterans and fraternal organizations. Mr. Springer was a member of the American Chemical Society and the executive committee of the Society's Rubber Division. He was also president of the Rhode Island Rubber Club. He belonged to many civic and social organizations and was a 32nd degree mason.

Arthur I. Kittinger

► Arthur I. Kittinger, co-founder and former president of the Mechanical Mold and Machine Co., Akron, Ohio, died on November 4. He was 71 years old. Mr. Kittinger was a member of several community organizations.

Arthur H. James

► Arthur Hayward James, formerly associated with the Dominion Rubber Co., died on October 21. He was 67 years old. Born in Sheffield, England, Mr. James went to Verdun, Montreal, Canada in 1910. There he joined the laboratory of the Dominion Rubber Co., Ltd., as a chemist. In 1919, he was transferred to the Latex and Reclaim Division, where in January, 1920, he became a foreman. He was named superintendent of the Latex and Reclaim Division in August, 1928 and in June 1933, he was transferred to Canadian Lastex. Later that year, he returned to the Latex and Reclaim Division continuing as superintendent until January, 1945, when he was transferred to the Traffic Department of the Papineau Factory. In April, 1946, Mr. James became Papineau factory safety supervisor. He retired from Dominion Rubber in 1955 and in 1956, he joined the Safety Supply Co., where he remained until his death. Mr. James was a member of the 24th Battalion, Victoria Rifles in World War I. He joined as a private and through several promotions became a sergeant-major, and an instructor in gas warfare. When the United States entered the War, Mr. James was sent to Virginia to give instruction to American troops. Mr. James was a member of many civic associations. He is survived by his wife and a son.

Johannes Alfthan

► Dr. Johannes Alfthan, a retired research chemist for E. I. du Pont de Nemours & Co., Inc., died on November 14 of a heart ailment. He was 65 years old. Born in Finland, Dr. Alfthan received a Ph. D. degree in chemistry at the University of Helsinki. He came to the United States in July, 1928, and joined the DuPont research department at Arlington, N. J., from which he retired for disability seven years ago. A developer of safety glass, Dr. Alfthan did pioneer work on a process for laminating plate glass to cellulose acetate plastic. He also worked on nylon and fluorocarbon resins. Some of his research went into the development of nylon filaments for toothbrushes and tempered bristles used in paint brushes. Dr. Alfthan was credited with devising a means of fabricating intractible fluorocarbon resins, which were used in marking Uranium-235, and received a certificate of recognition from the Manhattan Project. He belonged to the American Chemical Society and had been a member of the Finnish Chemical Society. He is survived by his wife.

► "Softbond", a new product for bonding foam rubber, polyether foam, polyurethane foam and vinyl foam, has been developed by Anchor Adhesives Corp.

New Laboratory Under Construction

► Hooker Electrochemical Co., Niagara Falls, N. Y., has begun construction of the Hooker Research Center on Grand Island, N. Y. The initial facilities will be completed by late 1958 or early 1959. To cost approximately $3,500,000, the new Research Center will provide space for about 200 persons. The 61 acre site is located near the North Grand Island Bridge and will be accessible from both West River Parkway and Long Road. All building areas will be connected and will initially utilize about 69,000 feet of floor space. The main two-story area, 244 feet long by 105 feet deep, will consist of a reception foyer, research administration and stenographic sections, research laboratories, a two-story library and a large conference room divisible into two smaller conference rooms by means of a folding wall. A connected single-story area will include a lunch room, glass-blowing shop, glassware washing area, central storage and solvents storage area. The services section will include air conditioning equipment for all laboratories and rooms in the main section, heating boilers, water treatment facilities and receiving area for laboratory supplies. Planned for the future are an auditorium, a research office wing, an extension to the initial laboratory wing, a duplicate laboratory wing and expanded storage for solvents.

Develops Specialty Primers

► Two new, specialized primers for fusing vinyl plastisols to metallic and nonmetallic surfaces have been developed by the Dennis Chemical Co., St. Louis, Mo. "Denflex No. 2394-1 White Primer" bonds plastisols to metal to form coatings which are said to withstand immersion in cold or boiling water and exposures to conditions of high humidity. It is supplied at a viscosity suitable for roll coat application, but if thinned with No. 4585 Thinner, it can be brushed, flow-coated or sprayed. According to the company, No. 2394-1 requires a minimum of pre-heating before application. Light in color, even after baking, it will not show through thin coats of pastel colored topcoats, the company claims. "Denflex No. 2394-30 Yellow Primer" is said to have superior bonding quality and to provide extreme resistance to salt spray and salt water immersion.

Improves Carbon Black Packaging

► Columbian Carbon Co., New York, N. Y., has introduced improved efficiency and economy in shipping, handling and warehousing carbon black in bags. Through recently completed studies, the company has developed a variety of palletizing patterns for bags to fit both cars and trucks during shipments and adapted to customer's facilities for storing and using carbon black. Designs appropriate for each situation are selected by consultation between the consumer and a Columbian representative.

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curing press for air springs

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First with Bag-O-Matic Presses

First with Automatic Bag-O-Matic Tire Presses

AND NOW...

First with Curing Presses for *Air Springs*

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And McNEIL is proud to announce its all-new Model 25-13-18 Air Spring Press, designed specifically to handle — profitably — the entire range of passenger car 'springs' presently contemplated.

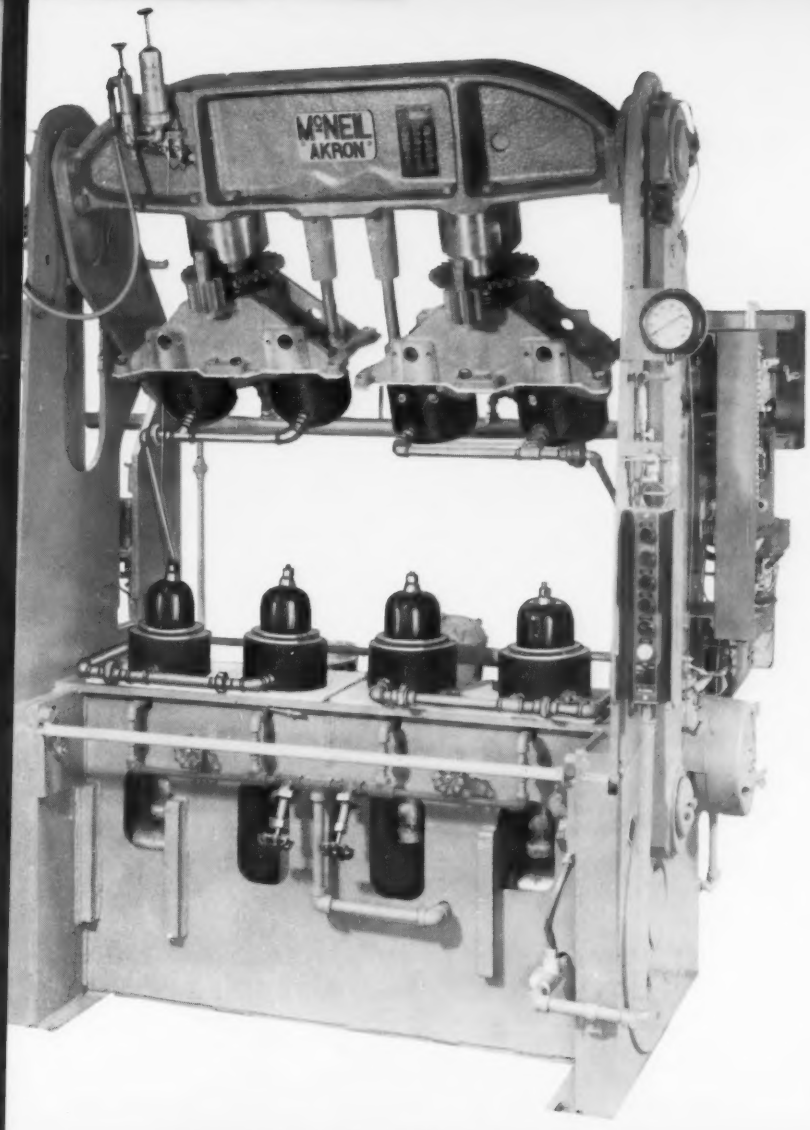
The McNEIL-AKRON 25-13-18 is a compact, four mold-position, electrically operated, self-contained BAG-O-MATIC unit for molds of from 6″ minimum to 18″ maximum thickness and having a maximum O.D. of 13″. Designed to utilize to the highest degree the unequalled BAG-O-MATIC techniques so well proved in tire production, the Model 25-13-18 duplicates all of the forming, curing and production features of other McNEIL-AKRON Presses. In addition, the new press will readily handle 2- and 3-piece molds . . . and it is *designed for economical conversion to automatic loading and unloading operations.*

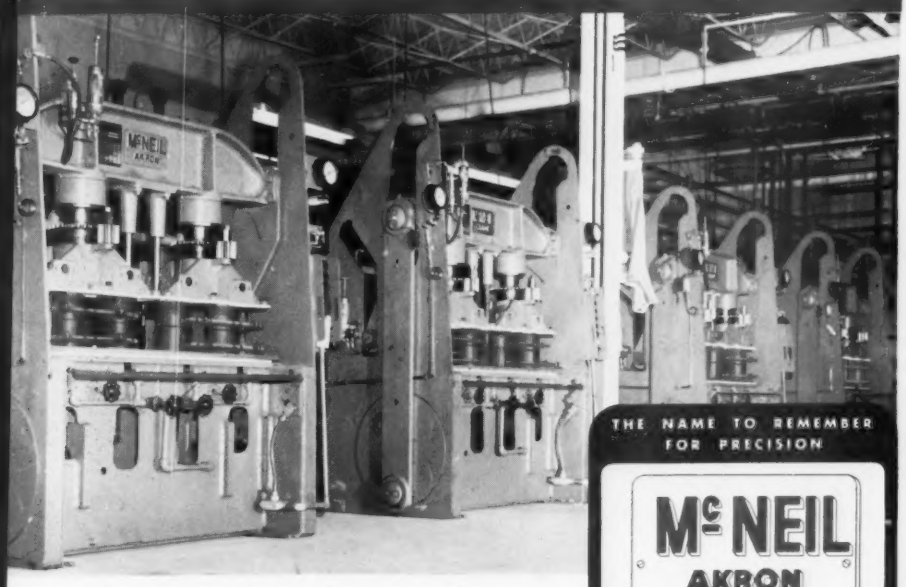
As with other McNEIL presses the entire curing cycle of the new press is accurately and automatically controlled from start to finish. It has automatic Lincoln "Multi-Luber" lubrication. There are no pumps to service and no rams to pack. It also has the added advantage of another McNEIL exclusive feature: MOBILITY. This means that *it can be disconnected and moved rapidly* to resume profitable operation in another location in an expanded plant or a new plant just as quickly as steam and electrical connections can be made.

Our organization will be pleased to consult with you and offer a complete proposal including press, mold design and manufacture . . . everything needed to begin production — *profitably.*

A. J. Michelson

VICE PRESIDENT IN CHARGE OF SALES





Typical installation of a battery of air spring presses in operation.

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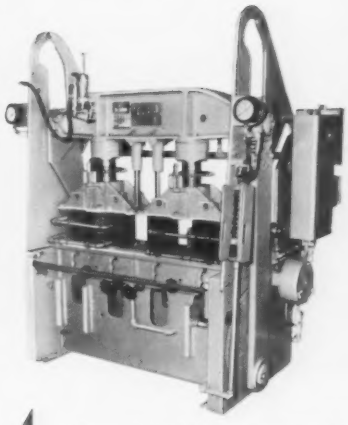
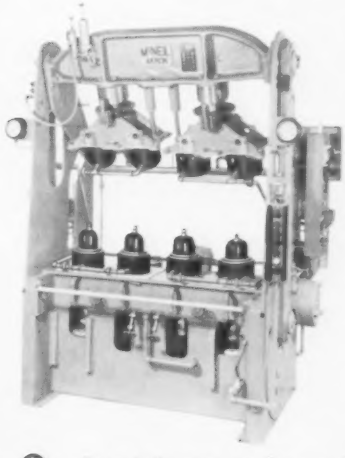
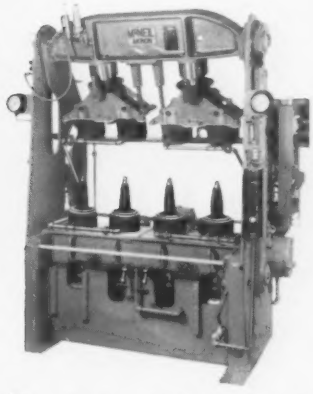


1. Press closed during cure cycle, using two-piece steam-jacketed molds.



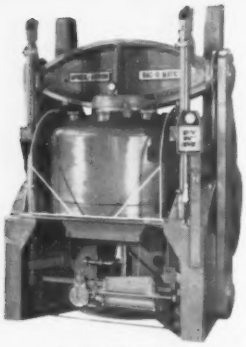
2. Press fully open, products ready for removal. Note top head tilted toward rear to facilitate loading and unloading.



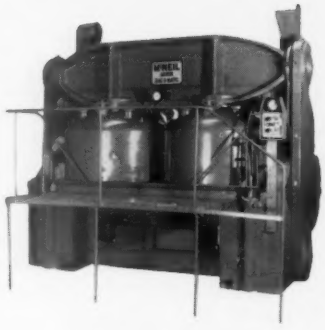
3. Press ready for loading of uncured air springs for subsequent cure — bags elongated and collapsed.

Only McNeil Makes a Practical Profit-Producing Press for Every Type of Tire and Mechanical Goods Production

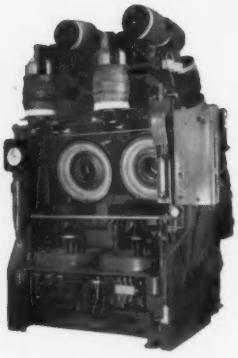
TIRE PRESSES



Model 900-75-25D
BAG-O-MATIC Tilt-Back



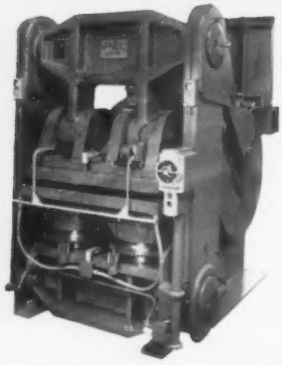
Model 450-55-16D
BAG-O-MATIC Tilt-Back



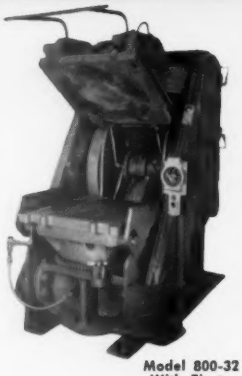
Model 230-40-11½
Twin BAG-O-MATIC

Model 300-47½-11½D
BAG-O-MATIC

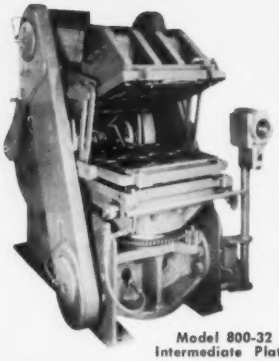
MECHANICAL GOODS PRESSES



Model 800-24x48-7
Electrically Heated
Platen

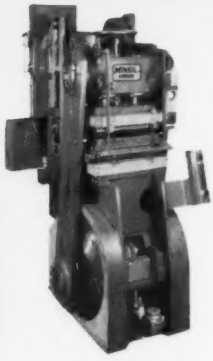


Model 800-32
With Ejector



Model 800-32
Intermediate Platen

Model 300
Transfer
Molding Press



Model 150
Transfer
Molding Press

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Overseas

By Comtel-Reuter

Zurich—Substantial increases in import duties on rubber have been proposed in the new "Swiss Draft and Customs Tariff Reform for Imports", which was published on November 1. The list will serve as a draft bill to be presented to the Swiss Parliament next year as well as a basis for negotiations with other countries.

Londonderry—Within the next few months, work will start on the construction of a new synthetic rubber plant at Maydown near Londonderry. The first factory to be built by E. I. du Pont de Nemours & Co., Inc., in Europe, the Maydown unit is scheduled for completion early in 1960.

Rome—The new Anic factory at Ravenna for the production of synthetic rubber and nitrogenous fertilizers is nearing completion. It is expected that the first bales of synthetic rubber to be produced by the firm will be placed on the market before the end of the year. Production in 1958 is scheduled to reach about 30 thousand tons with 60 thousand tons scheduled for 1959.

Djakarta—Under consideration in Indonesia is the creation of a special exchange for rubber transactions. With headquarters in Djakarta and branches throughout the Archipelago, the exchange would deal with high-grade rubber and have information about available stocks, places of origin and the volume of the production to be sold.

Paris—A new 20,000 ton per year butyl plant under construction at Port-Jerome near Le Havre by the Societe Du Caoutchouc Butyl is expected to come into production next October. The plant, said to be the first of its type in Europe, will cost 6,500 million francs.

Singapore—The Australian Government's recent imposition of import duties on synthetic rubber is expected to result in a big boost in Malaya's exports of rubber to that country. Previously, synthetic rubber was duty free CMA, while natural rubber was taxed.

Kuching Sarawak—More than $1,670,000 (Malayan) will be spent on rubber development next year in order to strengthen the rubber industry in Sarawak, current reports state.

Kuala Lumpur—Fragmentation of rubber estates has not caused serious unemployment in Malaya, according to the Minster for Natural Resources. Plantation workers have made strong protests against the breaking up of

estates. However, it is said that laborers from these estates had found little difficulty in obtaining employment on other plantations. The government does not plan special measures to help them.

London—A two-year survey of the health of workers in the rubber manufacturing industry will begin in 1959. The chairman of the third National Safety Conference for the industry has stated that every case of illness reported will be analyzed.

Singapore—Due to heavy buying by Russia and the Chinese Republic, Malaya's rubber export figures for October were the highest to that point. Trade sources state that Russia and China have imported at least 40 thousand tons of rubber in the past few months. Government statistics show that Malaya exported 63,615 tons of rubber in October.

London—Neoprene synthetic rubber will be produced in the United Kingdon by Du Pont Co. (United Kingdom) Ltd., a subsidiary of the American firm. A factory for neoprene production will be sited in Northern Ireland and is scheduled to go on stream early in 1959.

Kuala Lumpur—Rubber tappers have asked the Malayan Government to stop the break-up of plantations, suggesting the possibility of using the employees' fund to buy estates intended for sub-division. In response, the Malayan prime minister told the National Union of Plantation Workers that he would further investigate the question of fragmentation of estates.

Penang—The president of the Federation of Rubber Trade Associations has urged the Malayan government to produce synthesized natural rubber as a means of controlling price fluctuations instead of forming a buffer stock. At a recent GATT meeting in Geneva, it had been proposed that international action to form a rubber buffer stock might prevent violent fluctuations in the industry.

Frankfurt—West German output of rubber products is expected to continue its slight, but steady upward trend during the rest of this year, industry sources state. Present production of synthetic rubber totals about 10,000 tons a year, including about 7,000 tons of buna and between 3,000 and 4,000 tons of perbunan.

Kuala Lumpur—The Malayan government has extended its ban on the export of rubber seeds to cover all types of clonal seeds, stating that the available seeds are needed for a smallholders' rubber replanting scheme. The total ban will be imposed until such time as the requirements of the Director of Agriculture, acting on behalf of the Malayan smallholder, have been satisfied.

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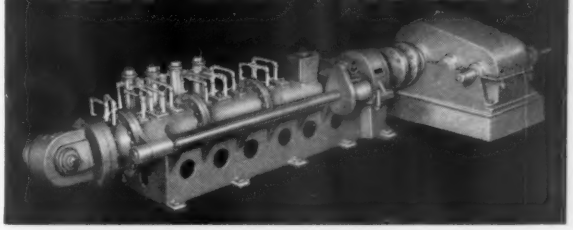

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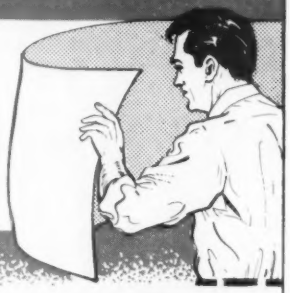

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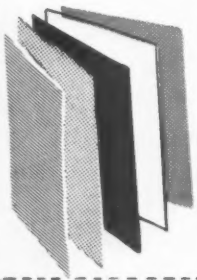

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Manufacturer of Tires, Tubes, V-Belts, Rollers, Polyurethane Products and other highly specialized and technical rubber products.

New Goods

Mighty-Grip Industrial Glove

► The "Mighty-Grip" work glove, introduced by the Industrial Glove Division of the Riegel Textile Corp., Conover, N. C., is a new type of industrial glove which is said to provide outstanding safety-grip without causing perspiration of the hands or tiring the fingers. Tough

and feather-light, the new glove features thousands of tiny non-skid plastic dots embedded in a new Riegel fabric. Every square inch of the glove contains 300 little dots permanently molded right into the cloth. According to the company, laboratory tests indicate that all the abrasive wear is absorbed by the dots, with little or no wear in the fabric itself. The dots are made of a special plastic that grips smooth surfaces, bulky objects and small, odd-shaped parts with equal ease. Strong, tear-resistant fabric is used in the Mighty-Grip work glove which is light in weight, flexible and permits rapid evaporation of perspiration.

Sunny Tears Life-Like Doll

► Sun Rubber Co., Barberton, Ohio, is now preparing for distribution a line of the "Sunny Tears" doll, a flexible plastic doll which sheds tears and wets diapers. Made of Pliovic AO, the doll is completely washable and the jointed arms, legs and movable head permit it to be placed in any position. According to the company, a unique feature of the doll is its reservoir system. This mechanism, which contains no moving parts, retains bottle fed water and releases a measured amount when the doll is tilted to induce tear shedding and diaper wetting. A voice apparatus in the body cavity issues baby-like cries and movable eyelids close when the doll is placed in a horizontal position. Dolls are decorated with either molded or rooted saran hair. Sunny tears dolls are manufactured in sizes ranging from 10 to 18 inches. Complete layette and accessory sets are also available.

Unicord Transmission Belt

► A new belt, developed by B. F. Goodrich Industrial Products Co., Akron, Ohio, is said to reduce belt stretch where transmission belts are used on drives. Length uniformity in the new belt, which was designed for use on all type drives, is maintained by controlling the amount of moisture in the air during manufacture. According to the company, too much moisture causes cords to shrink and when the average belt is put into operation on a drive, generated heat dries moisture and causes the belt to lengthen. The new type belt is manufactured under controlled humidity conditions, which enables engineers to regulate the amount of moisture retention in the cord carcass. The belt is also packaged in a hermetically-sealed polyethylene bag to prevent moisture from entering the cords during delivery and storage.

The new belt is named "Unicord" because the tension member consists of one ply of super strength synthetic cord, which is said to have the strength of five plies of the company's No. 50 cord. Goodrich claims that flex life of the Unicord belt is greater than other constructions on small pulleys because there are no plies to separate. The belt gives top performance at all speeds and runs straight and smooth, the company says. A loop built belt, the Unicord has folded edge construction formed by a black 2-ply straight-laid, wear-resisting envelope cover. It is available from 4 to 6 inches in width and 100 inches to 45 feet in length.

Vinyl Wonder Horse

► Wonder Products Co., Colliersville, Tenn., has introduced a new hobby horse which is molded in one piece from a vinyl plastisol material based on Geon polyvinyl

resins. Called the "Wonder Horse", the product is said to be rugged and yet light in weight. The horse is rotationally cast in one piece and is exceptionally accurate in detail and color, according to the company.

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MGO (Ignited Basis)	*97.9%*
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P. O. Box 671, Norristown, Pennsylvania

Three-Dimensional Plastic Games

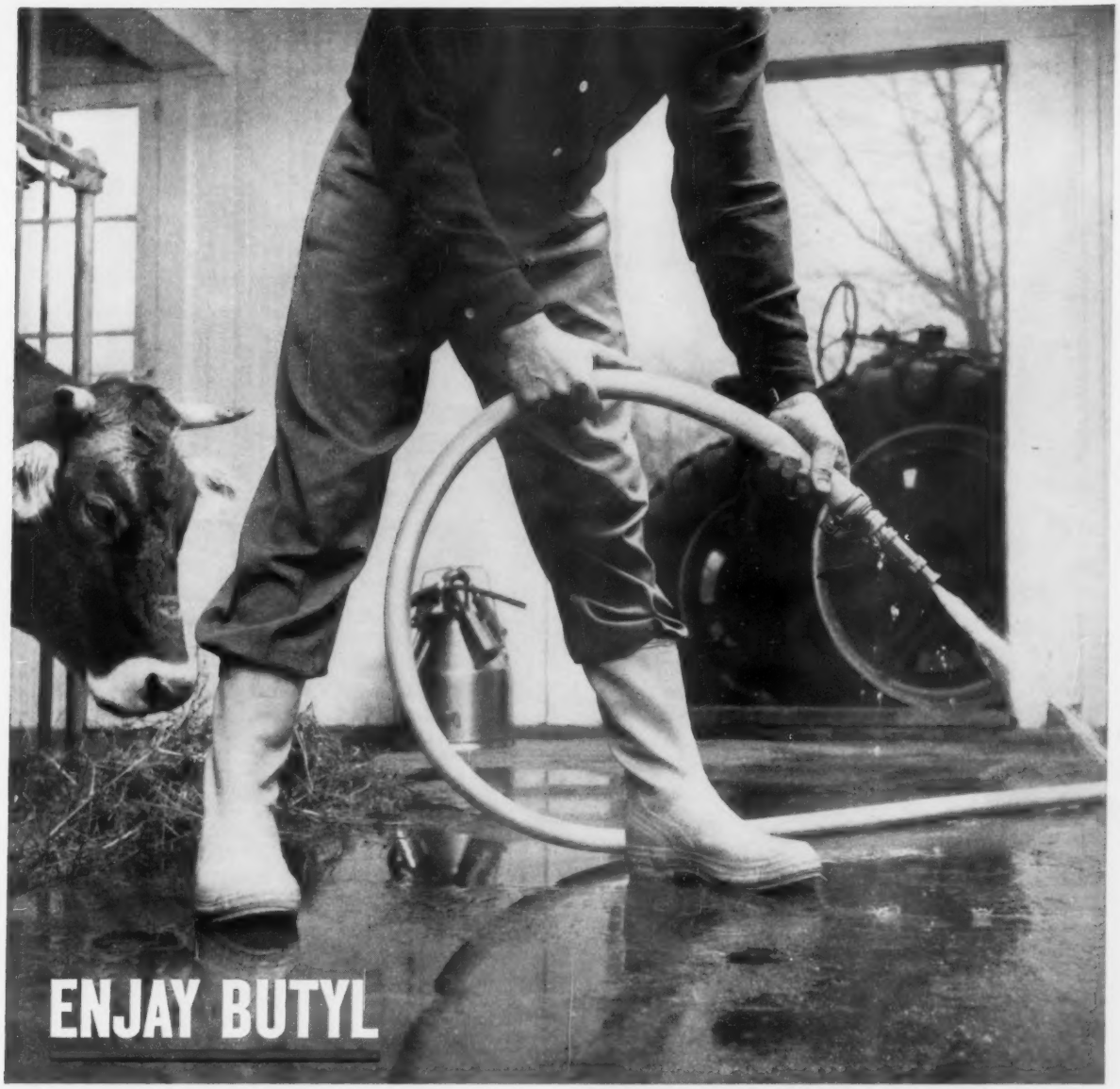
► Happy Hour, Inc., St. Paul, Minn., has introduced a colorful new line of three-dimensional games, made from vacuum formed Campco Registrite plastic. The games include a toss-type game called "Clown Ball", an educational toy called "Ticky," the clown clock, and a fast-playing game utilizing plastic chips and dice, called "9-All". Campco Registrite sheet is a specially-prepared material with a blue-white hue to enhance printed colors and a matte finish surface for printing ink adhesion. According to the company, the surface of the sheet is easily cleaned, abrasion resistant and will withstand much greater abuse than its cardboard counterparts.

Pinnacle Fire Hose

► "Pinnacle Fire Hose", manufactured by the B. F. Goodrich Industrial Products Co., Akron, Ohio, has been developed for protection against fire in coal mines, where spot lengths of fire hose are placed at convenient intervals. In mines, storage of hose is a problem as space is limited and the hose is exposed to sulfuric acid, limestone, coal dust and moisture in the mine atmosphere. To solve these problems, the jacket of the Pinnacle Fire Hose has been covered with a specially compounded synthetic rubber that resists acid, oil and abrasion. A synthetic filler in the cotton jacket gives extra strength and also makes a lighter and more flexible hose for easy racking in less space, the company claims.

Plastic Coated Upholstery

► Canadian Industries, Ltd., Montreal, Que., has introduced a new four-tone Fabrilite plastic coated upholstery material which has a tweed textured effect. The new material, known as the "Mindoro" pattern comes in a range of twelve colors: aqua, driftwood, blue mist, natural, saffron, crimson, mocha, clover pink, turquoise, coral, willow and evergreen. The material is said to provide ease of care, durability and wearing qualities, and good color. Mindoro comes in 54 inch widths.



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Performance! Versatility! Economy! In all three, Enjay Butyl is the world's outstanding rubber value. In a wide variety of applications, Enjay Butyl stands *unmatched* in its resistance to deterioration caused by animal and vegetable fats, chemicals, hot and cold water . . . properties that make Butyl-made products *outstanding* performers.

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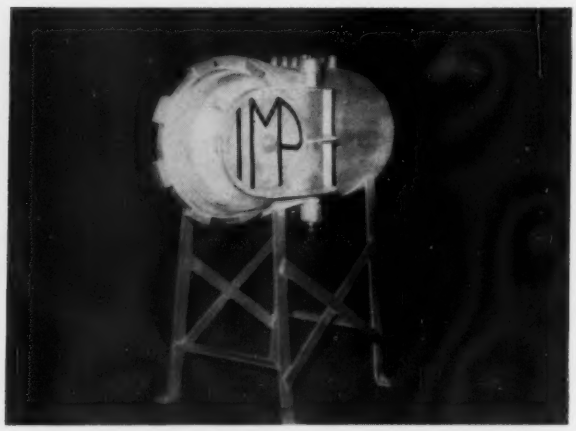
New Equipment

Vulcanizer and Autoclave Doors

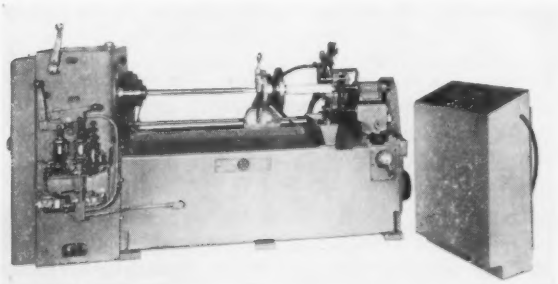
► Supplementing its complete line of steel and alloy plate fabrications for the rubber industry, Industrial Metal Products Co., Ravenna, Ohio, has developed a



new quick-opening door suitable for use on vulcanizers and autoclaves. Made in a wide range of sizes for various pressures, the door is said to meet all A.S.M.E. code requirements. Outstanding features are bronze bearings at all wearing points, extra heavy steel castings of welding neck design and heavy thrust bearing to carry the weight of the door. First cost, operation and maintenance are said to be low.

Black Rock Tape Cutter

► An improved semi-automatic tape cutter has been announced by the Black Rock Manufacturing Co., Bridgeport, Conn. The machine is said to make individual width cuts from full rolls of vinyl, plastic, and similar



tapes, and to do it so cleanly that there is no need for costly rewinding after cutting. The cutter handles material of maximum web up to 37 inches, of wall thickness up to 2½ inches, and paper core of up to 3½ inches inner diameter. A manually controlled machine of the same capacity is also available. Both cutters are equipped with variable speeds and back gear ratios.

Photograph by d'Arazien

THE PEACE THAT IS CHRISTMAS

Soon the countryside will awaken again to the wonder of Christmas, to the joyous sound of church bells ringing out the old familiar carols, to the warm excitement of homes gaily decorated with holly and mistletoe, to a new-born hope for peace on earth and good will to all men. And may we join with all the others in wishing you

A Very Merry Christmas and a
Happy, Healthy and Prosperous New Year

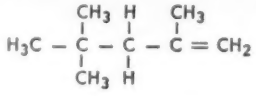
CYANAMID

AMERICAN CYANAMID COMPANY
Rubber Chemicals Department
Bound Brook, New Jersey

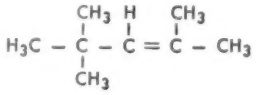
now—DIISOBUTYLENE for January 1958 delivery

In January Petro-Tex will come on stream with substantial production of high-purity diisobutylene. Our commercial product will be a clear water-white 4 to 1 mixture of

2,4,4-trimethylpentene-1



and 2,4,4-trimethylpentene-2



with these physical properties:

Molecular Weight, average, calculated	112.1
Specific Gravity @ 60°F	0.720 – 0.722
Engler Distillation Range (@ 760 mm Hg)	
Initial	210°F (98.9°C)
90% point	218°F (103.3°C)
95% point	219°F (103.9°C)
Bromine Number	140
Sulfur Content, less than	60 ppm
Reid Vapor Pressure, psi	1.4

Uses include depolymerization to yield isobutylene
Alkylation with phenol toward production of surface active agents
Manufacture of nonyl alcohol by the oxo process

Working samples, detailed technical data and quotations will gladly be sent upon request to us at P. O. Box 2584, Houston 1, Texas.

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Modifications for State-of-Cure Tester

► Modification devices for equipping its T-50 state-of-cure testers for temperature retraction and brittleness tests have been announced by Scott Testers, Inc., Providence, R. I. Originally designed to determine the state

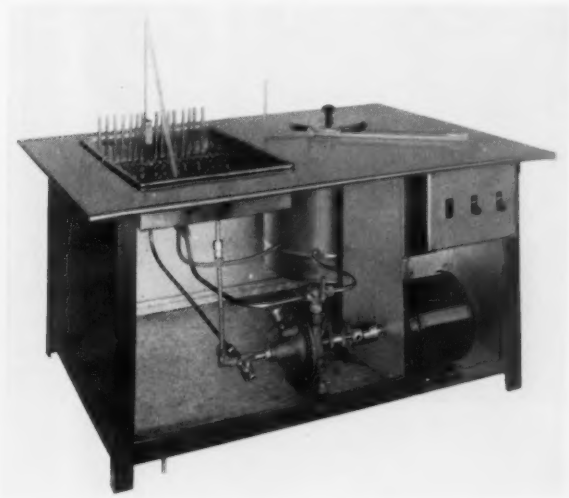

FIG. 1—T-50 Scott tester modified for temperature-retraction test.

of cure of elastomeric compounds at temperatures of −50°C. to −65°C. in accordance with A.S.T.M. Specification D-599-55, T-50 testers already in use are said to be easily equipped by users' personnel with the new modifications. One of these, illustrated in Figure 1, permits testing of specimens for temperature retraction at −70°C. in accordance with A.S.T.M. D-1329-54T, while the other, shown in Figure 2, performs brittleness evaluation at necessary temperatures for compliance with A.S.T.M. D-746-55T. New owners may obtain the T-50 testers with either or both modifications.

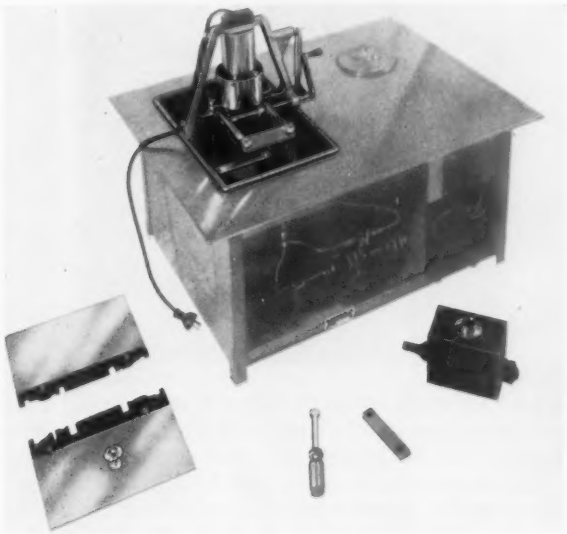

FIG. 2—T-50 Scott tester modified for brittleness test.

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FOR STORING, COOLING, DRYING, CURING AND PROTECTING MATERIALS THAT CANNOT BE STACKED

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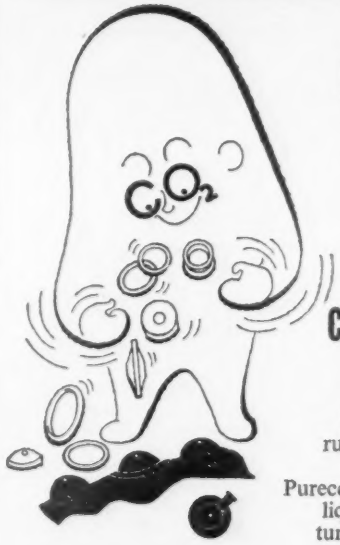

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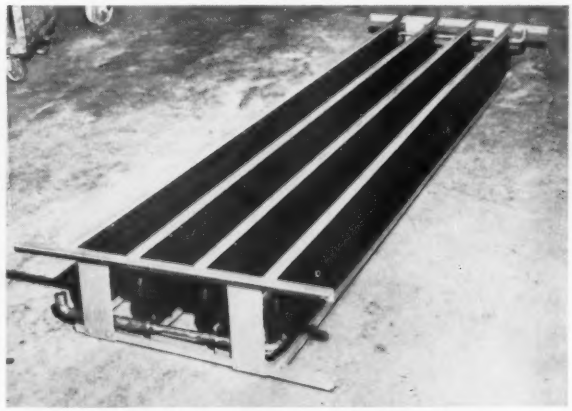
CUTTING AND PERFORATING DIES

AVON, MASS.

Reflectotherm Radiant Cooling Unit

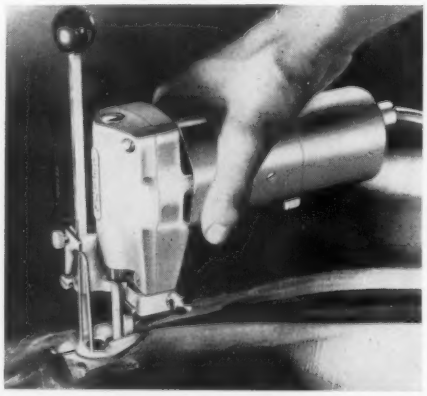
► The radiant cooling of rubber products is made possible by a device developed by Reflectotherm, Inc., 26 East University Ave., Cincinnati 19, Ohio. The cooling of



rubber products by radiant heat exchange takes advantage of the natural release of energy by radiation rather than by the conventional convection process, thus effecting reduction in cooling time and saving in floor space and labor, says the manufacturer. The radiant cooling device illustrated is kept cool by the circulation of water from a cooling tower, well or other source. Such units can be installed in existing air cooled tunnels. Complete new tunnels of any width or length are also available.

Lesto Electric Rubber Cutter

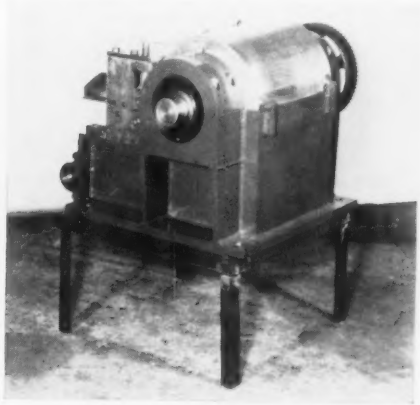
► The Lesto electric rubber cutter is designed for cutting rubber, plastics and similar materials in any desired



shape. Materials up to one inch in thickness can be cut with the standard blade, and up to three-eighths inch in thickness with a piercing knife. Also available is a circle cutting attachment for circles up to 24 inches in diameter. The cutter is imported by Victor J. Krieg, Inc., 611 Broadway, New York 12, N. Y., representative for Scintilla, S. A., Solothurn, Switzerland.

Improved Pelletizer Design

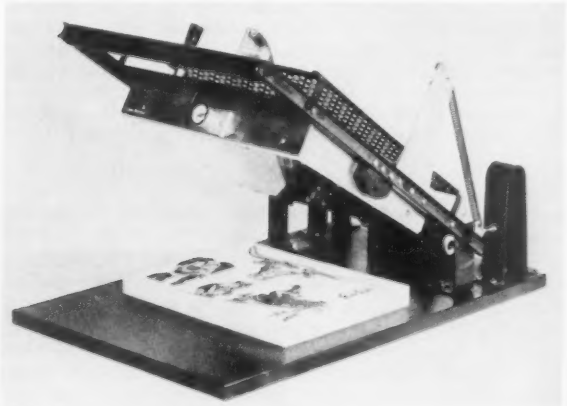
► Improved design features have been incorporated into the pelletizers manufactured by Taylor, Stiles & Co., Riegelsville, N. J. To give the 700 Series pelletizers



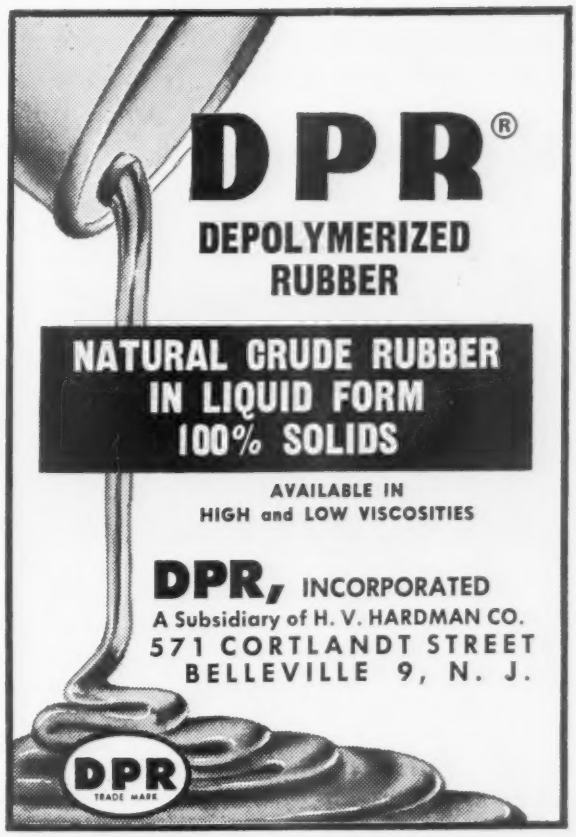
more rigidity and to make the whole machine more compact, a cartridge type roller bearing, mounted in a housing which is an integral part of the machine base, has replaced the separate housing and ball bearing formerly used. To facilitate cleaning of the feed rolls and the area around the stationary cutting edge or knife bed, the feed roll assembly has been redesigned to make removal of the roll easier.

Franklin Decal Transfer Machine

► A small machine for imprinting colored designs, lettering or advertising messages on urethane foam with a decalcomania and heat transfer method is distributed by



General Foam Corp., 640 West 134th St., New York 31, N. Y. Called the Franklin Heat Transfer Machine, it can print one or more designs up to 9 by 12 inches in size in from one to three colors simultaneously. A new decal is used for each item, so the design is changed by substituting a different type decal without adjustment of the machine. The machine is 24 by 16 by 10 inches in size and weighs 25 pounds.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Reviews

BOOKS

The Chemistry of Petrochemicals. By Marvin J. Astle. Published by the Reinhold Publishing Corp., 430 Park Avenue, New York 22, N. Y. 6 x 9 in. 267 pp. $6.50.

Thoroughly up-to-date in every respect, this book offers a systematic, readable survey of the petrochemical industry. It describes the preparation and important chemical reactions of industrial chemicals made directly or indirectly from petroleum hydrocarbons. Commercially important chemical reactions, as well as many which are potentially of commercial interest, are described. These chemical descriptions are supplemented by useful information on reaction conditions, types of catalysts used, special equipment, and other factors necessary for properly carrying out the processes. Considerable attention is given to published results of petrochemical research and to newest developments in both theory and practice. A discussion of the petrochemical industry cannot be complete without calling attention to some of the newer research which may eventually lead to commercial products, and this the author has done. This research may well indicate future trends in the industry and may result in many new ideas for future research. Anyone wishing to gain a broad background of what has been accomplished in the field of petrochemicals will find this book of interest and value.

•

Selection of Management Personnel. (In Two Volumes). Edited by M. J. Dooher and Elizabeth Marting. Published by the American Management Association, 1515 Broadway, New York 36, N. Y. 6 x 9¼ in. (each volume). 892 pp. (total). $15.00.

Locating effective and efficient management talent is becoming increasingly difficult. Previous methods are rather inadequate. Accordingly, management should welcome this new two-volume handbook which is believed to be the first publication to report fully and authoritatively on new selection techniques. Using a general approach that is applicable to technical, sales, accounting and other specialized personnel, this reference work examines the entire selection process. It defines the essential nature of the manager's job, identifies the qualities necessary for success in business and industry, and describes how managers are chosen and evaluated. Specific testing, interviewing and merit-rating methods are thoroughly explained. As a special feature, the work includes nineteen case studies of actual company practices in management selection, including those utilized by the Armstrong Cork Co. and the Dewey and Almy Chemical Corp.

•

Source Book of Industrial Solvents. Volume 2: Halogenated Hydrocarbons. By Ibert Mellan. Published by the Reinhold Publishing Corp., 430 Park Avenue, New York 22, N. Y. 6 x 9 in. 267 pp. $7.00.

The second in a series of four volumes, this reference work presents a concise picture of the composition and properties of industrial solvents. It is a practical source of information, compiled especially for active members of the industries which utilize solvents. This second volume is devoted to halogens, fluorinated hydrocarbons, brominated hydrocarbons, and iodinated hydrocarbons. Commercial and proprietary names are used instead of chemical nomenclature; the solvents are classified in accordance with their distillation range; and a wide spectrum of properties is given in tabular form for each solvent. This book is an attempt to select from the great amount of available literature those materials of greatest practical value, and to present those materials in an organized, compact, readily accessible manner. It will be a timesaver for every industry or group involved with the manufacture or use of solvents.

BOOKLETS, CATALOGS, etc.

Baker Castor Oil Products for Urethane Polymers. (Technical Bulletin 31). Baker Castor Oil Co., 40 Avenue A, Bayonne, N. J. 8½ x 11 in. 24 pp.

This bulletin discusses the application of castor oil and its derivatives to urethane technology. It contains sections on refined castor oil, castor oil derivatives and applications. Included in the latter are discussions of prepolymers, rigid and semi-rigid foams, flexible foams, solid plastics and elastomers, coatings and adhesives. The closing sections are devoted to chemical structures of castor oil products, a table of typical physical properties of castor oil derivatives, and a bibliography. The publication contains valuable information for anyone interested in the utilization of castor oil in polymers.

•

Principles of Microradiography. Instruments Division, Philips Electronics, Inc., 750 South Fulton Ave., Mount Vernon, N. Y. 8½ x 11 in. 48 pp.

This volume was prepared for the special symposium on microradiography which was part of the program at the Conference of the Electron Microscope Society of America held at Massachusetts Institute of Technology in September, 1957. One section, which is devoted to principles of the science, covers such subjects as contact and projection techniques and X-ray microscopy. Among other subjects discussed are specimen preparation techniques, applications and industrial uses. Nearly 500 references are listed in the bibliography, which was prepared by the Eastman Kodak Research Laboratories.

•

Mark Stabilizers. (Technical Bulletin No. 1). Argus Chemical Corp., 633 Court St., Brooklyn 31, N. Y. 8½ x 11 in. 24 pp.

This technical bulletin on the stabilization of polyvinyl chloride deals with barium-cadmium stabilizer systems and the applicability of various Mark stabilizers for specific functions. A description of the stabilizers with their physical properties and processing characteristics is given, and how to choose a stabilizer system is discussed in relation to processing considerations, formulation variables and end use requirements. Applications are discussed under the headings of calendered products, extruded products, and plastisols and organosols.

•

One to 125 Horsepower Totally-Protected A-C Motors. (Bulletin No. B-2506). Reliance Electric and Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio. 8½ x 11 in. 4 pp.

Advantages of Reliance totally-protected a-c motors are detailed in this brochure. Described are features of the line: totally-protected insulation system, guarded coil heads and coil head connections, metermatic bearings, positively sealed conduit box and dynamically balanced rotor. Photographs and schematic diagrams are used to illustrate the construction of the motors.

•

New Dow Corning Silicone Coating. (Bulletin No. 8-601). Dow Corning Corp., Midland, Mich. 8½ x 11 in. 4 pp.

This bulletin deals with the properties and performance of papers treated with new Dow Corning silicone coatings. Points reviewed include non-contamination, non-migration, non-alteration of stocks, permanency, water repellency and handling economy. Included are samples of one-side coated kraft, glassine and parchment. The information is presented in concise form, and the appearance is attractive and neat.

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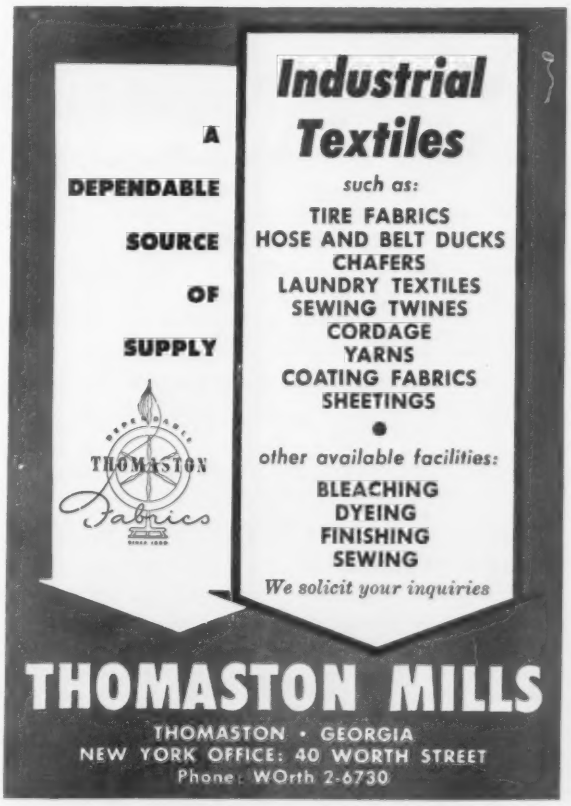

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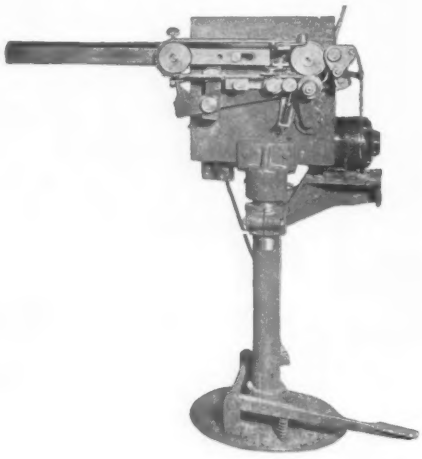

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REVIEWS (CONT'D)

Case Studies in Production Forecasting, Planning and Control. (Manufacturing Series 223). American Management Association, Inc., 1515 Broadway, New York 36, N. Y. 6 x 9 in. $1.75.

In this publication three companies report in detail on their practical approaches to production forecasting, planning and control. It opens with an analysis of the role of management decisions in relation to these subjects, and then gives three long chapters on how Capitol Records plans at all levels to produce an efficient manufacturing operation; how McCormick & Co. organizes and develops its sales forecasting operation, and how Clinch Manufacturing Corp. plans for mixed-run manufacture of parts. Interesting reading for those who operate manufacturing concerns in this era of ever increasing complexity.

•

Design Data and Application of Cone-Drive Double Enveloping Worm Gearing. (Bulletin CD-200). Cone-Drive Gears Division, Michigan Tool Co., 7171 East McNichols Road, Detroit 12, Mich. 8¾ x 11 in. 24 pp.

Extensive technical information on the design and application of double-enveloping worm gearing available from Cone-Drive Gears is presented in this attractive booklet. Featured are detailed engineering formulas and instructions for using them in designing and applying the gearing to drives of all types. Service factors and lubrication information are also included. An extensive use of schematic diagrams and photographs clarifies the text.

•

Paracril OZO for Ozone Resistance and Oil Resistance. (Bulletin No. 219). By R. R. Barnhart. Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. 8½ x 11 in. 12 pp.

Paracril OZO, a new addition to the Paracril family of oil-resistant rubbers, is the subject of this bulletin. The polymer is described and indicated uses are given. Extensive data on processing and basic compounding are presented. The publication closes with the formulas for stocks for specific end uses, such as wire jackets, with original properties of the stocks and properties after aging for various lengths of time under different conditions. The presentation is handsome.

•

Shell Synthetic Rubber. Synthetic Rubber Sales Division, Shell Chemical Corp., P. O. Box 216, Torrance, Calif. 8¼ x 11 in. 14 pp.

This attractive publication presents data on the synthetic rubbers produced by Shell. These include hot rubber (non-pigmented and black masterbatch), cold rubber (non-pigmented, black masterbatch, oil masterbatch and oil-black masterbatch), and latices (hot and cold). A description and uses of each are given in text form, and properties of the raw polymers and compounded stocks are given in tables. Standard test recipes for the latter are also included.

•

Guartec. . . An Outstanding Guar Gum. Special Commodities Division, General Mills, Inc., 400 Second Ave. South, Minneapolis 1, Minn. 8½ x 11 in. 12 pp.

The story of Guartec, industrial grade guar gum of General Mills, is told in this attractive publication. Properties, uses and actual technical applications as a selective flocculant, flotation reagent, stabilizer, dispersant, suspending agent, viscosity modifier, film former and water sealer are discussed. Technical aspects of the material are presented by formulas, charts, graphs and tables. The use of illustrative photographs is excellent.

Zalba. (Report No. 57-9). Prepared by H. Fishman and R. W. Bell. Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 6¼ x 9½ in. 20 pp.

Zalba, a new DuPont antioxidant of the hindered phenol class, is described in this bulletin. Physical properties and compounding characteristics are detailed. Various sections analyze its effectiveness in latices, in dry elastomers and in styrene rubber. Tables and graphs are used to present data on changes in the physical properties of the various compounds effected by the introduction of Zalba. The booklet offers a brief but clear and comprehensive outline of the characteristics of the new antioxidant.

•

The Homo Method of Steam Atmosphere Heat Treating. [Catalog TD-2-620 (1)]. Leeds & Northrup Co., 3934 Stenton Ave., Philadelphia 44, Penna. 8½ x 11 in. 20 pp.

The advantages achieved with steam atmosphere heat treating in many industrial processes, including the making of molded rubber parts, are enumerated in this catalog. Furnace and control equipment for the process are described. Discussion of the benefits achieved in the curing of molded rubber parts includes decrease of permanent set and flex-cracking, removal of undesirable odors, and advantages over autoclaves. Photographs and artwork, with color, are used to advantage.

•

Plastolein 9078 LT Plasticizer. (Technical Bulletin No. 401). Emery Industries, Inc., Department 5, Carew Tower, Cincinnati 2, Ohio. 8½ x 11 in. 6 pp.

This bulletin describes the properties of a relatively new low cost, low temperature plasticizer, Plastolein 9078 LT, and also details the performance of the product in vinyls as compared to currently available adipates. Different sections describe the material, give tentative specifications and performance data, and indicate end uses and availability. A table is used to present comparative data on the performances of the new plasticizer with others.

•

Link-Belt Geared Flexible Couplings. (Book No. 2775). Link-Belt Co., Department PR, Prudential Plaza, Chicago 1, Ill. 8½ x 11 in. 12 pp.

This booklet describes the complete line of geared flexible couplings manufactured by Link-Belt Co. It details pertinent application and selection data for couplings with maximum bores ranging up to seven inches and ratings from 2½ to 572 horsepower per 100 rpm. Four basic types, each available in ten standard sizes, are discussed. Photographs, schematic diagrams and tables are used to present the data graphically and concisely.

•

Discovering Tomorrow Today. U. S. Rubber Co., 1230 Avenue of the Americas, New York 20, N. Y. 8¾ x 11¾ in. 32 pp.

This booklet, devoted to the new research center of U. S. Rubber at Wayne, N. J., presents a view of the company's scientists, engineers and specialized technicians, and the setting in which they work. An extensive text explains the research developmental technique, from the idea to the finished product. Numerous photographs, many in color, amplify the text and portray graphically the role of the company's scientific personnel and their research. The presentation is unusually attractive.

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MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (November 1), the price of spot rubber on the New York Commodity Exchange has moved in the range of 137 points, high for the period being 28.00c reached on November 1, 19 and 26, and low being 26.63c reached on November 12. The average price of spot rubber for the month of November was 27.47c based on 18 trading days. This compares with an average of 29.24c in October.

As reported by analysts at Merrill, Lynch, Pierce, Fenner & Beane, the futures market continues in a downtrend. Occasional bursts of support tend to be primarily technical. New life-of-contract lows have been set up again. That the price outlook is likely to continue forming strong trends down or up (probably down) is indicated by the well-maintained total open interest.

Within the past few weeks, January as well as the nearby has been under liquidation. New buying and selling have been prominent in the Mays, Julys and Octobers. As prices indicate, the buying has been generally scaled down. Premiums have decisively developed on the forward positions, disregarding the retired November.

Lack of Aggressiveness

Operations remain the same, with lack of aggressiveness, purchases or sales. Unlike last year, when the foreign situation suddenly worsened at Suez, there is, for the moment, no area in serious political circumstances. The statistical situation in rubber, together with the business outlook, does not promise anything encouraging for natural rubber, MLPFB analysts state.

The picture in rubber today is reminded of 1952. Prices have been in a downtrend and, at this point, March would have to recover to above 28c on good buying to suggest that the downtrend had been halted. Such a price move might come about as a result of technical conditions, but a real halt to the trend would probably have to result from an unexpected wave of consumer buying.

Russian and Chinese purchases have been running a little higher than last year, but they have failed to increase at the rate of 1956 over 1955. Moreover, buying by these countries has usually evaporated on price recoveries. It is thought that if Russian purchases are stepped up again, they still wouldn't influence the price trend. At the best, accelerated Russian buying might merely arrest the downtrend.

One of the few hopeful signs lately was the better tone at Singapore, despite the large imports from Indonesia. Leading shippers are said to be of the opinion that the turn of the market's trend is not yet at hand.

Slight Natural Surplus

Statistically, 1957 may show a tiny world surplus of natural rubber. On the other hand, total world use of both natural and synthetic may increase more this year than last. Total use of both rubbers in the United States in October was just short of the all-time record made this past January.

NEW YORK, DECEMBER 2, 1957

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM NOVEMBER 1 TO NOVEMBER 30

Nov.	Spot	Jan.	Mar.	May	July	Sales
1	28.00	27.85	27.95	27.95	27.95	69
2	....	....	....	....	....	...
3	....	....	....	....	....	...
4	27.38	27.20	27.28	27.25	27.25	85
5	....	....	....	....	....	...
6	27.63	27.50	27.60	27.50	27.50	45
7	27.00	26.90	27.00	27.00	26.90	94
8	27.00	26.80	26.80	26.80	26.82	18
9	....	....	....	....	....	...
10	....	....	....	....	....	...
11	....	....	....	....	....	...
12	26.63	26.55	26.55	26.60	26.55	105
13	26.88	26.80	26.85	26.85	26.95	71
14	27.00	27.00	26.95	26.85	27.02	136
15	27.38	27.30	27.40	27.45	27.45	76
16	....	....	....	....	....	...
17	....	....	....	....	....	...
18	27.25	27.15	27.25	27.35	27.47	54
19	28.00	28.10	28.10	28.15	28.20	177
20	27.75	27.75	27.80	27.85	27.90	94
21	27.63	27.60	27.70	27.70	27.70	65
22	27.75	27.80	27.90	27.95	27.95	47
23	....	....	....	....	....	...
24	....	....	....	....	....	...
25	27.88	27.90	28.00	28.10	28.15	22
26	28.00	28.05	28.20	28.15	28.20	87
27	27.75	27.75	27.85	27.90	27.90	53
28	....	....	....	....	....	...
29	27.63	27.70	27.77	27.80	27.80	38
30	....	....	....	....	....	...

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.27 5/8
Jan.	.27 5/8
Feb.	.27 5/8
Thin Latex Crepe:	
Spot	.30
Thin Brown Crepe, No. 2	.25 1/8
Flat Bark Crepe	.21 1/2

London Market
(Standard Smoked Sheets)

Jan.-Mar.	27.35 - 27.49
Apr. June	27.79 - 27.93

Singapore Market
(Standard Smoked Sheets)

Jan.	25.61 - 25.69

Middling Upland Quotations

	Nov. 1	December 2		
	Close	High	Low	Close
Dec.	34.89	36.19	35.94	35.97
Mar.	34.98	36.26	36.15	36.21
May	35.01	36.21	36.10	36.18

Notes & Quotes

According to John L. Collyer, chairman of the board of the B. F. Goodrich Co., 63 per cent of the new rubber used in the United States this year will be synthetic—a peacetime record. Speaking at the recent Rubber Manufacturers Association meeting in New York City, Mr. Collyer said he was "confident that the percentage will go substantially higher in the years ahead." Mr. Collyer observed that the total synthetic rubber producing capacity in the United States has been increased by almost 50 per cent since private industry purchased the synthetic rubber plants from the government just a little more than two years ago. He pointed out that all of the expansion has been financed entirely by private industry.

Synthetic Rubber

The Rubber Manufacturers Association reports that October synthetic rubber production of 106,398 long tons topped by a wide margin the previous monthly record of 95,012 long tons established in May of this year. Accounting for this increased production, S-type amounted to 87,730 long tons in October against the previous monthly high of 77,124 long tons last May and compares with 75,872 long tons in September. Total synthetic rubber production in September was 94,679 long tons.

The ratio of synthetic rubber use to total new rubber continued to edge upward reaching 64.49 per cent in October against 64.01 per cent in September and 63.20 per cent in the first ten months of the year.

Foreign Use Rising

It is interesting to note how the percentage use of synthetic rubber has been rising in other countries compared with the United States since 1954. In the Free World outside the United States and Canada, the statistics of the International Rubber Study Group indicate that synthetic rubber accounted for 6.7 per cent of new rubber consumption in 1954, 10.8 per cent in 1955, and about 16.2 per cent in 1956. Individual countries, of course, show wide variations from these averages.

Further increased use of synthetic rubber in foreign free countries depends on supplies obtained from the United States and Canada, at present, but there will be expanded or new production facilities operating in Germany, England and France in 1958, according to reports of scheduled production.

The U.S. Commerce Department points out that in the U.S., a progressive gradual reduction in the use of natural rubber has taken place in the tires and tubes segment of the rubber industry from the first quarter of 1955 through the third quarter of 1956. This downtrend was continuous except for a slight upswing in the first quarter of 1956, chiefly owing to a low rate of production of tread rubber in that quarter.

A substantial rise occurred in the consumption of S-type rubber partly at the expense of other synthetic types in this segment, largely influenced by the further fall in the use of butyl rubber.

Non-Tire Segment Figures

The non-tire segment of the industry likewise shows a progressive decline in the use of natural rubber through the second quarter of 1956, with an upswing in the third quarter when of all the rubber used in the non-tire segment, approximately 37.44 per cent was natural.

In the non-tire segment, consumption of S-type rubber reached its highest point, 45.05 per cent, in the fourth quarter of 1955. Use of natural accounted for 36.55 per cent, and other rubbers accounted for 18.40 per cent. Neoprene, N-type and butyl rubbers have accounted for a steadily increasing share of the total consumption in this segment, the Commerce Department notes.

PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER POLYMERS

(dry types—per pound carload unless otherwise specified)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [3]
Chemigum N3 and N5	.5800 [3]
Chemigum N6 and N7	.5000 [3]
Herecol N-33	.6800 [3]
Hycar 1001	.5800 [3]
Hycar 1002	.5000 [3]
Hycar 1014	.6000 [3]
Hycar 1041	.5800 [3]
Hycar 1042 and 1043	.5000 [3]
Hycar 1312	.5000 [3]
Hycar 1411	.6200 [3]
Hycar 1432	.5900 [3]
Hycar 1441	.6200 [3]
Paracril AJ	.4850 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril BLT	.5000 [2]
Paracril C	.5800 [2]
Paracril CV	.5900 [2]
Paracril D	.6500 [2]
Paracril 18-80	.6000 [2]
Polysar Krynac 800	.5000 [3]
Polysar Krynac 801	.5800 [3]
Polysar Krynac 802	.5000 [3]
Polysar Krynac 803	.5000 [3]

Butadiene-Styrene Types

Ameripol 1000	.2410 [3]
Ameripol 1001	.2410 [3]
Ameripol 1002	.2435 [3]
Ameripol 1006	.2410 [3]
Ameripol 1007	.2425 [3]
Ameripol 1009	.2475 [3]
Ameripol 1500	.2410 [3]
Ameripol 1501	.2410 [3]
Ameripol 1502	.2410 [3]
Ameripol 1703	.2060 [3]
Ameripol 1705	.2035 [3]
Ameripol 1707	.1910 [3]
Ameripol 1708	.1910 [3]
Ameripol 1710	.1885 [3]
Ameripol 1712	.1885 [3]
ASRC 1000	.2410 [3]
ASRC 1001	.2410 [3]
ASRC 1004	.2410 [3]
ASRC 1006	.2410 [3]
ASRC 1009	.2475 [3]
ASRC 1018	.2700 [3]
ASRC 1019	.2650 [3]
ASRC 1500	.2410 [3]
ASRC 1502	.2410 [3]
ASRC 1503	.2625 [3]
ASRC 1703	.2060 [3]
ASRC 1708	.1910 [3]
ASCR 3110	.2600 [3]
Baytown 1600	.1760 [2]
Baytown 1601	.1760 [2]
Baytown 1602	.1760 [2]
Baytown 1801	.1600 [2]
Copo 1500	.2410 [3]
Copo 1502	.2410 [3]
Copo 1505	.2610 [3]
Copo 1712	.1885 [3]
FR-S 1000	.2410 [3]
FR-S 1001	.2410 [3]

Butadiene-Styrene (Cont'd)

FR-S 1004	.2410 [3]
FR-S 1006	.2410 [3]
FR-S 1009	.2475 [3]
FR-S 1010	.2600 [3]
FR-S 1012	.2425 [3]
FR-S 1013	.2500 [3]
FR-S 1014	.2810 [3]
FR-S 1015	.2910 [3]
FR-S 1500	.2410 [3]
FR-S 1502	.2410 [3]
FR-S 1703	.2060 [3]
FR-S 1705	.2035 [3]
FR-S 1712	.1885 [3]
Naugapol 1016	.2650 [3]
Naugapol 1018	.2700 [3]
Naugapol 1019	.2650 [3]
Naugapol 1021	.3000 [3]
Naugapol 1022	.2800 [3]
Naugapol 1023	.2850 [3]
Naugapol 1503	.2625 [3]
Naugapol 1504	.2950 [3]
Philprene 1000	.2410 [1]
Philprene 1001	.2410 [1]
Philprene 1006	.2410 [1]
Philprene 1009	.2475 [1]
Philprene 1010	.2600 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1940 [1]
Philprene 1104	.1900 [1]
Philprene 1500	.2410 [1]
Philprene 1502	.2410 [1]
Philprene 1503	.2625 [1]
Philprene 1600	.1930 [1]
Philprene 1601	.1930 [1]
Philprene 1605	.1900 [1]
Philprene 1703	.2060 [1]
Philprene 1706	.2030 [1]
Philprene 1708	.1910 [1]
Philprene 1712	.1885 [1]
Philprene 1803	.1740 [1]
Plioflex 1006	.2410 [3]
Plioflex 1500	.2410 [3]
Plioflex 1502	.2410 [3]
Plioflex 1703	.2060 [3]
Plioflex 1710	.1885 [3]
Plioflex 1712	.1885 [3]
Plioflex 1773	.2060 [3]
Plioflex 1778	.1910 [3]
Polysar Kryflex 200	.2410 [3]
Polysar Krylene	.2410 [3]
Polysar Krylene NS	.2410 [3]
Polysar Krynol 651	.1885 [3]
Polysar Krynol 652	.1910 [3]
Polysar S	.2410 [3]
Polysar S-50	.2410 [3]
Polysar S-X 371	.2550 [3]
Polysar SS-250	.3000 [3]
S-1000	.2300 [2]
S-1001	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1502	.2300 [2]
S-1600	.1825 [2]
S-1601	.1825 [2]
S-1602	.1825 [2]

Butadiene-Styrene (Cont'd)

S-1703	.1950 [3]
S-1706	.1925 [3]
S-1707	.1800 [3]
S-1709	.1775 [3]
S-1712	.1775 [3]
S-1801	.1675 [3]
S-1803	.1650 [2]
Synpol 1000	.2410 [1]
Synpol 1001	.2410 [1]
Synpol 1002	.2435 [1]
Synpol 1006	.2410 [1]
Synpol 1007	.2410 [1]
Synpol 1009	.2475 [1]
Synpol 1012	.2425 [1]
Synpol 1013	.2500 [1]
Synpol 1061	.2410 [1]
Synpol 1500	.2410 [1]
Synpol 1502	.2410 [1]
Synpol 1551	.2410 [1]
Synpol 1703	.2060 [1]
Synpol 1707	.1910 [1]
Synpol 1708	.1910 [1]
Synpol 1711	.1900 [1]
Synpol 1712	.1885 [1]

Butyl Rubbers

Enjay Butyl 035 and 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Butyl 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [3]
Polysar Butyl 101	.2775 [3]
Polysar Butyl 200 and 300	.2450 [3]
Polysar Butyl 301	.2550 [3]
Polysar Butyl 400	.2450 [3]

Neoprene

(prices l.c.l.)

Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type WRT	.4500 [2]
Neoprene Type WX	.4100 [2]

Silicone Rubbers*

(prices l.c.l.)

GE (compounded)	2.50 [3]
GE Silicone Gum (not compounded)	4.00 [3]
Silastic (compounded)	1.90 [3]
Silastic (gums)	3.85 [3]
Union Carbide (gums)	4.00 [3]
Union Carbide (compounds)	2.50 [3]

Polysulfide Rubbers

(prices l.c.l.)

Thiokol Type A	.4700 [2]
Thiokol Type FA	.6400 [2]
Thiokol PR-1	.9500 [2]
Thiokol Type ST	1.00 [3]

(latices—all prices per pound dry weight)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [3]
Chemigum 235	.5400 [3]
Chemigum 236	.5400 [3]
Chemigum 245	.4600 [3]
Chemigum 246	.4600 [3]
Hycar 1512	.4600 [3]
Hycar 1551	.5400 [3]
Hycar 1552	.4600 [3]
Hycar 1561	.5400 [3]
Hycar 1562	.4600 [3]
Hycar 1571	.5400 [3]
Hycar 1572	.5100 [3]
Hycar 1577	.4600 [3]
Hycar 1852	.4600 [3]

Butadiene-Styrene Types

Copo 2101	.3000 [3]
Copo 2102	.3200 [3]

Butadiene-Styrene (Cont'd)

Copo 2105	.3200 [3]
Copo X-765	.3000 [3]
FR-S 2000	.2775 [3]
FR-S 2001	.2775 [3]
FR-S 2002	.3000 [3]
FR-S 2003	.3050 [2]
FR-S 2004	.3050 [2]
FR-S 2006	.2900 [2]
FR-S 2105	.3200 [3]
Pliolite 2101	.3000 [3]
Pliolite 2104	.3200 [3]
Pliolite 2105	.3200 [3]
Pliolite X-765	.3000 [3]
Naugatex 2000	.2630 [2]
Naugatex 2001	.2630 [2]
Naugatex 2002	.2880 [2]
Naugatex 2006	.2630 [2]
Naugatex 2105	.3120 [3]
Naugatex X-765	.2900 [3]
Naugatex X-767	.3120 [3]

Butadiene-Styrene (Cont'd)

S-2000	.2275 [3]
S-2006	.2150 [3]
S-2101	.2250 [3]
S-2105	.3100 [3]
S-2107	.3200 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.7000 [3]
Thiokol Type WD-2	.9200 [2]
Thiokol Type WD-6	.7000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

MARKETS

(continued)

Reclaimed Rubber

According to the U.S. Department of Commerce, reduced use of natural rubber during 1957 has been accompanied by reduced demand for reclaimed rubber. As the content of scrap tires became increasingly more S-type, reclaim has had to compete more and more with new S-type as a material for compounding with natural rubber. Meanwhile, costs of collecting, sorting, and transportation of scrap rubber have gradually risen. As a result, tire reclaim prices have increased from below 8½c a pound in 1949, to 11c a pound during the past year.

The hydrocarbon content averages over 50 per cent of the weight of reclaim, but since oil-extended S-type rubber sells for about 19c a pound, the former economic advantage of using reclaimed rubber has been lessened for numerous applications.

In three of the last four years, consumption of reclaimed rubber has been near 50 per cent of natural rubber usage. The exception was 1954, when supplies of natural rubber sufficed for a notably larger share of the total consumption than in the other three years.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

There were few new developments in the scrap rubber market during the past period, with business mainly of a routine nature. Suppliers were mainly busy filling mixed automobile tire orders for shipment to reclaimers in the East. Trade circles do not expect to see any change in prevailing market conditions in the last few weeks of the current year.

The Rubber Manufacturers Association reports that 204,041 long tons of scrap rubber were consumed in the United States in the first ten months of this year. Stocks as of October 31 were estimated at 80,377 long tons. It will be seen from the foregoing that some 220,000 long tons will be consumed in 1957.

While scrap prices are low, supplies have apparently been ample for demand, although collections of ordinary scrap are confined largely to metropolitan centers located not too distant from reclaiming operations.

(Prices Delivered Akron)

Mixed tires	ton	15.50
Light colored carcass	lb.	.05½
No. 1 peelings	ton	35.00
No. 2 peelings	ton	28.00
No. 3 peelings	ton	20.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	19.00
Passenger S.A.G.	ton	17.50
Natural Rubber Red Tubes	lb.	.08
Natural Rubber Black Tubes	lb.	.07
Butyl Rubber Tubes	lb.	.04½

Tire Fabrics

According to the Textile Economics Bureau, second quarter 1957 output of tire cord and fabric was 104,000,000 pounds, down 7 per cent from the first quarter, but slightly above the 101,000,000 pounds produced in the second quarter of the preceding year. The decline from the first quarter of this year occurred entirely in rayon, while both nylon and cotton cord and fabric showed gains over the first quarter.

In the first six months of this year, output of rayon tire component at 107,000,000 pounds was down 6 per cent from the 182,000,000 pounds produced in the first six months of the preceding year; cotton items (excluding chafer fabric) at 5,000,000 pounds were off 1,000,000 pounds, while nylon cord and fabric at 40,000,000 pounds, was 43 per cent above the 28,000,000 pounds used in the first half of 1956. Nylon usage at an annual rate of 80,000,000 pounds would be up 31 per cent over 1956.

Indian Tire Yarn Plant

The Export-Import Bank of Washington has reportedly confirmed that the National Rayon Corp. of Bombay has received a $1,800,000 loan authorization to partly finance a proposed $3,000,000 rayon tire yarn plant to be built near Bombay. The plant may be located at Kaylan, the site of the company's existing textile rayon yarn plant.

The installation of rayon tire yarn facilities of National Rayon would be the first of its kind in India. At the present time, five firms in addition to National Rayon produce rayon or acetate yarn or staple for textile purposes.

Domestic Trade Reports

Domestic trade sources state that within the past few weeks, good interest has been noted in wide osnaburg fabrics. These fabrics are being combined with vinyl sheeting and used for side panels and other automobile interior applications. The cloth has gained a wider acceptance because of its relatively low price and because it possesses a relatively high cross-tear strength due in part to the loose binding type weave.

In wide coating fabrics generally, the demand for staples continued to lag, but specialty constructions are getting a better call, with some specialty fabrics selling for delivery beyond the first of the year. Because specialty fabrics are made to customers' specifications, spot delivery and anticipations can not be obtained, trade sources point out, and this has spurred forward buying.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.73
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.80

Rayon Graded Fabric

100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.68
9.25 oz. (per square yard)	lb.	.66
11.65 oz. (per square yard)	lb.	.62
14.4 oz. (per square yard)	lb.	.71

Liquid Latex

Natural: Figures available from the Rubber Manufacturers Association indicate that in the first ten months of this year, 62,423 long tons of natural latex were imported into the United States. During the same period, 1,316 long tons were re-exported, leaving a total net new supply of 61,107 long tons. In the first ten months of 1957, 63,579 long tons were consumed in the United States. As of October 31, 1957, there were 12,463 long tons of natural rubber latex on hand.

At the rate of consumption indicated in the first ten months of the current year, it seems apparent that a total of about 75,000 long tons of natural rubber latex will be consumed in this country in 1957. This figure will be slightly in excess of the 74,082 long tons of natural rubber latex consumed in 1956, but far below the 86,478 long tons consumed in 1955, the highwater point.

An interesting point to note is that during 1956, natural rubber latex sold at higher prices than were in evidence so far in 1957. At this writing, natural rubber latex is selling at about 36-37c a pound at East Coast ports in car load lots. We can therefore assume that the lower prices for natural rubber latex in effect throughout most of 1957 have not had too much effect upon total consumption patterns.

Synthetic: Production of S-type latex in the United States in 1957 will apparently run slightly ahead of the previous year with some 74,000 long tons against 69,720 in the previous year. Figures available from the U. S. Department of Commerce indicate that in the first nine months of the current year, some 55,000 long tons of S-type latex were produced in this country. In the same period last year, about 50,000 long tons were produced.

Consumption of S-type latex, however, seems to be paralleling the previous year. In the first nine months of this year, close to 50,000 long tons of S-type latex were consumed in the United States. In the first nine months of the previous year, about 47,500 long tons were consumed.

In 1957, 8,733 long tons of neoprene latex were consumed in the United States and 8,934 long tons of N-type. On the basis of figures currently available covering the the first nine months of this year, it now appears as if 9,200 long tons of neoprene latex and some 8,400 long tons of N-type latex will be consumed in the United States in 1957.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in a range of 145 points since our last report (November 1), high for the period being 36.70c reached on November 22, and low being 35.25c reached on November 1 and again on November 4. The average price af middling uplands for the month of November was 36.06c based on 18 trading days. This compares with an average of 35.09c in the previous month.

The trade reports that the President's illness had little or no effect on the cotton market. The gyrations in the stock market, likewise, had little or no influence. There are definite indications that some major legislation on cotton is in prospect when Congress meets in January. The huge losses sustained in the cotton program, and the industry-wide demands for a one price system will likely be aired by Congress.

CALL!

the fastest cure for worry about cancer: a call to your doctor now!

Scared? You shouldn't be! Look at it this way. The average man who walks into the doctor's office walks out floating. That lump that was so frightening . . . nothing to worry about at all! The sky's bluer, the air's sweeter, it's a great big beautiful day . . . because he picked up that phone and called!

It happens all the time. It can happen to *you*. "Sure," you say, "but just supposing". . . OK. Let's look at the facts. In past years, we were saving 1 out of 4 cancer patients. Today, we're saving 1 in 3. And the odds could get better still . . . if *people would call their doctors in time!*

So go ahead . . . call. See your doctor now. And after your checkup—how about a check for the American Cancer Society? Every dollar sends us further along the road to cure. And when *that* happens . . . it's going to be a wonderful day for us all! Send your check to "Cancer" in care of your local Post Office.

MARKET PRICES

CHEMICALS & COMPOUNDING INGREDIENTS

DECEMBER 2, 1957

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carload; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l., less than carload; M.B. masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*Trademark. †For Export Only.

The arrangement of this section closely follows the Chemical Section of the 1955-56 RUBBER RED BOOK. Readers are referred to that edition for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)*	lb.	.72	.79
A-32*	lb.	.66	.80
A-100*	lb.	.52	.66
Accelerator No. 8*	lb.	——	1.25
Accelerator—49*	lb.	.59	.60
Accelerator 89*	lb.	——	1.20
Accelerator 108*	lb.	——	.92
Accelerator—552*	lb.	——	2.25
Accelerator—808*	lb.	.66	.68
Accelerator—833*	lb.	1.17	1.19
Accelerator B*	lb.	——	.89
Altax*	lb.	.52	.54
Ancap*(†)	lb.	.38	.40
Ancatax*(†)	lb.	.48	.50
Ancazate BU (ET & ME)*(†)	lb.	——	1.07
Ancazide ET*(†)	lb.	——	1.07
ME*(†)	lb.	——	1.14
Arazate*	lb.	——	2.25
Arquad 12*	lb.	.55	.61
Beutene*	lb.	.66	.68
Bismate, Rodform*	lb.	——	3.00
Butazate*	lb.	——	1.04
Butyl Eight*	lb.	1.10	1.35
Butyl Namate	lb.	.45	.50
Butyl, Ethyl & Methyl Zimate Slurry (50% solids content)	lb.	.85	.89
Captax*	lb.	.42	.44
C-P-B*	lb.	——	1.95
Cumate, Rodform*	lb.	——	1.45
Diorthotolylguanidine	lb.	.62	.63
Dipac*	lb.	——	.85
Diphenylguanidine	lb.	.54	.60
El-Sixty*	lb.	.62	.69
Ethazate*	lb.	——	1.04
50D*	lb.	——	.85
Ethyl Thiurad*	lb.	——	1.04
Ethyl Tuex*	lb.	——	1.04
Ethylac*	lb.	.93	.95
Guantal*	lb.	.62	.69
Harvex*	lb.	.70	.76
Hepteen Base*	lb.	——	1.85
Kure-Blend MT*	lb.	——	.70
Ledate, Rodform*	lb.	——	1.04
MBT-XXX*	lb.	.53	.55
Merac*	lb.	.75	1.05
Mercaptobenzothiazole	lb.	.42	.44
Mercaptobenzothiazyl Disulfide	lb.	.52	.54
Mertax*	lb.	.55	.57
Methazate*	lb.	——	1.04
Monex*	lb.	——	1.14
Mono Thiurad*	lb.	——	1.14
Morfex*	lb.	.65	.67
2-MT	lb.	——	1.00
NA-22* (for neoprene)	lb.	——	1.05
NOBS No. 1*	lb.	.76	.78
Special*	lb.	.80	.82
O-X-A-F	lb.	.55	.57
Pentex*	lb.	——	1.24
Flour*	lb.	——	.30
Permalux (Neoprene)*	lb.	——	2.25
Phenex*	lb.	.55	.57
Polyac*	lb.	——	1.85
R-2 Crystals*	lb.	——	4.35
Rotax*	lb.	.53	.55
RZ-50-A*	lb.	——	1.00
B*	lb.	——	1.00
Santocure*	lb.	.76	.83
NS*	lb.	.80	.87
Selenac* (Ethyl, Methyl)	lb.	——	4.25
Seleram, Ethyl	lb.	——	4.25
Setsit-5*	lb.	.75	1.05
9*	lb.	.85	1.15
SPDX-GH*	lb.	.74	.76
GL*	lb.	1.20	1.30
Tellurac*	lb.	——	1.45
Tepidone*	lb.	.45	.48
Tetrone A*	lb.	——	1.98
Thiofide*	lb.	.54	.56
S*	lb.	.64	.66
Thionex*	lb.	——	1.14
Thiotax*	lb.	.44	.51
Thiram, Ethyl	lb.	——	1.04
Methyl	lb.	——	1.14
Thiurad*	lb.	——	1.14
Thiuram E*	lb.	——	1.04
M*	lb.	——	1.14
Trimene*	lb.	.56	.58
Base*	lb.	1.03	1.06
Triphenyl Guanidine	lb.	——	.90
Tuads* (Ethyl)	lb.	——	1.04
Tuads* (Methyl)	lb.	——	1.14
Tuex*	lb.	——	1.14
Ultex*	lb.	1.00	1.10
Unads*	lb.	——	1.14
ZB*	lb.	——	.85
ZE*	lb.	——	.85
ZM*	lb.	——	.85
Vulcacure NB*	lb.	.45	.45
NS*	lb.	.75	1.05
ZB*, ZE*, ZM*	lb.	.85	.89
Z-B-X*	lb.	——	2.45
Zenite*	lb.	.54	.56
Zenite A*	lb.	.69	.71
Zenite Special*	lb.	.55	.57
Zetax* (uncoated)	lb.	.53	.55
Zimate* (Butyl)	lb.	——	1.04
Zimate* (Ethyl)	lb.	——	1.04
Zimate* (Methyl)	lb.	——	1.04
Ziram, Butyl	lb.	——	1.04
50% Dispersion	lb.	.87	.89
Ziram, Ethyl	lb.	——	1.04
50% Dispersion	lb.	.87	.89
Ziram, Methyl	lb.	——	1.04
50% Dispersion	lb.	.87	.89

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.17¼	.18¼
Cottonseed Fatty Acids			
Wochem 210*	lb.	——	.16¾
211*	lb.	——	.16¾
Fish Oil, Hydrogenated, Fatty Acid			
DAR-S* (dlvd.)	lb.	.13¼	.15¾
DAR-HY* (lvd.)	lb.	.16	.18½
Hydrofol Acids* (dlvd.)	lb.	.15¼	.17¼
Hyfac 430* (dlvd.)	lb.	.16¾	.19¼
Neo-Fat H.F.O.* (dlvd.)	lb.	.14½	.15¾
Neutrex* (lvd.)	lb.	.15¾	.18¼
Stearex Beads* (dlvd.)	lb.	.09¾	.10¾
Stearite*	lb.	.12	.14
Talene* (dlvd.)	lb.	.17	.19½
Lime, Hydrated			
Arrowhead*	ton	——	21.00
Marblehead*	ton	——	17.75
Sierra*	ton	——	22.50
Litharge			
Eagle-Picher* (c.l.)	lb.	.18	——
SB* (dlvd.)	lb.	——	.18½
Magnesium Oxide, Heavy			
General Magnesite 500*	lb.	.05½	.06
600*	lb.	.06½	.07
Kaiser 325*	lb.	.057	.073
Michigan No. 15*	lb.	.05½	.06½
Magnesium Oxide, Light			
Carey Mag*	lb.	.25¼	.26
General Magnesite* (neoprene grade)	lb.	.30	.32
General Magnesite No. 101*	lb.	.25¼	.26
Genmeg MLW*	lb.	.25¼	.26
K & M* (neoprene grade)	lb.	.29¼	.30

ACTIVATORS (Cont'd)

Magnesium Oxide, Light (cont'd)			
Light Calcined Magnesia No. X-01*	lb.	.25¼	.26
Maglite D*	lb.	.25¼	.26
L and M*	lb.	.29¼	.30
Michigan No. 30*	lb.	.25¼	.26
Neomag Powder*	lb.	.29¼	.30
Pellets*	lb.	.31¼	.32
Michigan No. 40*	lb.	.29¼	.30
Oleic Acid			
Emersol 210* (dlvd.)	lb.	.19½	.22
Groco Red Oil	lb.	.20	.22½
Neo-Fat 92-04*	lb.	.20½	.22½
94-04*	lb.	.18½	.20½
Wochem 310, 311	lb.	.20	.22½
Palm Fatty Acids			
Groco 45*	lb.	.15¾	.18¼
Neo-Fat*	lb.	.15¾	.17¾
Wochem 280*	lb.	.15¾	.18¼
281*	lb.	.16¼	.18¾
Potassium Oleate (dms.)	lb.	.30	.73
Red Lead			
Eagle-Picher* (c.l.)	lb.	.19	——
No. 2 RM* (dlvd.)	lb.	——	.18½
Sodium Laurate, 75%	lb.	.64	.89
Sodium Oleate, 75%	lb.	.54	.79
Paste (dms.)	lb.	.39	.64
Sodium Stearate, 75%	lb.	.54	.89
Stearic Acid, Single Pressed			
Emersol 110* (dlvd.)	lb.	.16	.18½
Groco 53*	lb.	.16½	.19
Neo-Fat 18-53*	lb.	.14¾	.16¾
Standard Pearlstearic* (dlvd.)	lb.	.16	.18½
Stearex B* (dlvd.)	lb.	.15½	.16¾
Wochem 730*	lb.	.13¼	.15¾
Stearic Acid, Double Pressed			
Choice Pearlstearic* (dlvd.)	lb.	.16½	.19
Emersol 120* (dlvd.)	lb.	.16½	.19
Groco 54*	lb.	.17	.19½
Hydrofol Acid 51RG	lb.	.13¼	.15¾
Neo-Fat 18-54*	lb.	.15¼	.17¼
Wochem 731*	lb.	.16	.18½
Stearic Acid, Other			
Extra Pearlstearic* (dlvd.)	lb.	.18¾	.21¼
Groco*	lb.	.12	.14
Neo-Fat 18*	lb.	.18½	.20½
18-58*	lb.	.14¼	.16¾
18-61*	lb.	.16¼	.18¾
Stearite*	lb.	.11¼	.13¾
Wochem 720*	lb.	.11¾	.14¼
721*	lb.	.11¾	.14¼
732*	lb.	.17	.19½
White Lead Basic Carbonate	lb.	.19	.20
White Lead Basic Sulfate	lb.	.17¼	.18¼
Zinc Laurate			
Laurex*	lb.	.33	.34
Zinc Stearate	lb.	.41	.46
Aquazinc K.C.*	lb.	.30	.55
Crown Brand*	lb.	.39	.44

Unclassified Activators

Actifat* (dms.)	lb.	——	.18
Aktone*	lb.	.21¼	.23¼
Barak*	lb.	——	.62
Curade*	lb.	.57	.59
Dibenzo G-M-F	lb.	——	2.60
D-B-A*	lb.	——	1.95
G-M-F*	lb.	——	2.60
Dibutylamine (dlvd.)	lb.	.55½	.56½
MODX*	lb.	.36	.38
Neo Fat 42-07*	lb.	.10¼	.12¼
Ridacto* (dms.)	lb.	.25	.26
Snodotte* (dlvd.)	lb.	.19	.21½
Vimbra	lb.	.32	.38½
Vulklor*	lb.	.88	.98

ANTI-COAGULANTS

Aqua Ammonia* (dms.)	lb.	.031	.035
M.B.M.C.* (l.c.l.)	lb.	.54	.76

ANTI-FOAMING AGENTS

Aero Anti Foam H*	lb.	——	.20
Regular*	lb.	——	.12
Anhydrol 6991*	lb.	.51	.56
D.C. Antifoam A*	lb.	5.45	6.65
Antifoam A Emulsion*	lb.	2.05	4.00
Antifoam AF Emulsion*	lb.	2.05	2.85
Defoama W-1701*	lb.	——	.12½
Defoamer A-25*	lb.	——	3.00
Defoamer 630*	lb.	——	.14
Deltyl Prime	lb.	.70	.80

HOGGSON TOOLS, MOLDS, DIES

For Rubber Testing and Production

"DUMBELL" Test Strip Die D412(5IT)

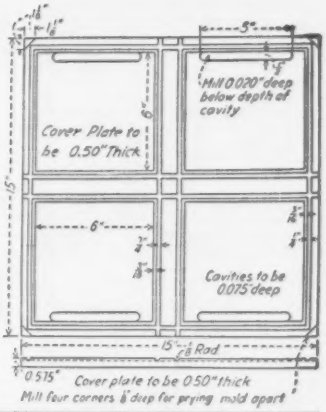
BENCH MARKER

1" and 2" Centers

MALLET HANDLE DUMBELL DIE

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB MOLD D15-41


5"
Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
6"
Cavities to be 0.075 deep
15" Rad
0.515"
Cover plate to be 0.50" thick
Mill four corners 8 deep for prying mold apart

HOGGSON & PETTIS MFG. CO., 141A Brewery St., New Haven 7, Conn.

Pac. Coast: H. M. Royal, Inc., Los Angeles

smells removed—sales improved

Custom-created odor control chemicals for any rubber product —natural, synthetic, foam. Add Alamask directly to liquid state. Call us about your problem.

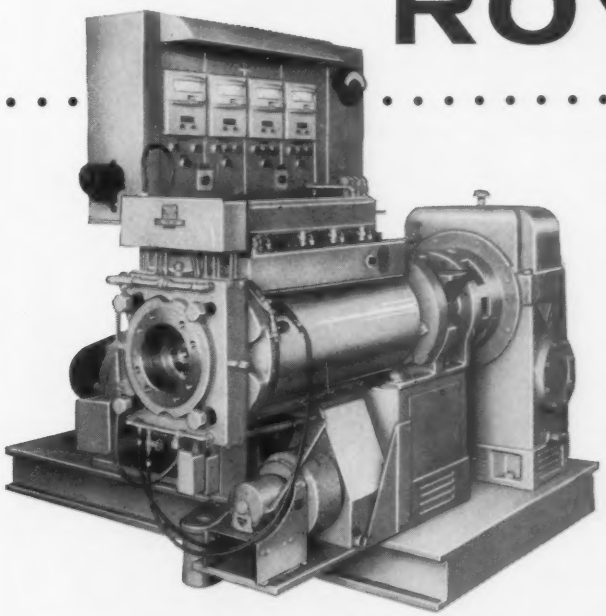
RHODIA INC.

60 EAST 56TH STREET, NEW YORK 22, N.Y. (PHONE PL. 3-4850) REPRESENTATIVES IN: PHILADELPHIA · CINCINNATI · CHICAGO · DENVER · LOS ANGELES · MONTREAL · MEXICO CITY

it's Alamask® treated foam rubber

ROYLE

SPIROD® EXTRUDERS



These all electric extruders with radiant heat and high velocity evaporative cooling are designed to process either plastic or rubber compounds. The result of more than three quarters of a century of experience — Royle pioneered the extrusion process in 1880— in the design and construction of extruding machines time tested features have been built into Spirod to assure dependability.

Write for Bulletin #463

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.	Tokyo, Japan
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.	Okura Trading Co., Ltd.
Hyde Park 2430 - 0456	SHerwood 2-8262	BLackstone 3-9222	LUdlow 9-3261	(56) 2130 - 2149

ANTI-FOAMING AGENTS (Cont'd)

G-E Antifoam SS-24*	lb.	5.30	6.65
SS-66*	lb.	5.30	6.65
60 Emulsion*	lb.	2.05	3.75
Igepol CO-210	lb.	—	.36
Kessco X-3* (dms.)	lb.	—	.35
X-180*	lb.	—	.29¾
X-181*	lb.	—	.38½
Nopco 1407*	lb.	.19½	.20½
1497-V*	lb.	.13¾	.14¼
1907-B*	lb.	.18¼	.19¼
JMK*	lb.	.48	.49
JMU*	lb.	.22½	.23½
JMY*	lb.	.19¼	.20¼
Pluronic L61*	lb.	.33½	.39
RS-968*	lb.	.38	.38½
Terpinol Prime No. 1	lb.	.35	.50
Tributyl Phosphate (dms.)	lb.	.52½	.53½

ANTIOXIDANTS

Agebest 1293-22A*	lb.	1.90	2.00
AgeRite Alba*	lb.	2.35	2.45
Gel*	lb.	.67	.69
Hipar*	lb.	1.00	1.02
H.P.*	lb.	.76	.78
Powder*	lb.	.55	.57
Resin*	lb.	.82	.84
Resin D*	lb.	.55	.57
Spar*	lb.	.55	.57
Stalite*	lb.	.55	.57
Stalite S*	lb.	.55	.57
Superlite*	lb.	.55	.57
White*	lb.	1.45	1.55
Akroflex C*	lb.	.85	.87
CD*	lb.	.79	.81
Aminox*	lb.	.57	.59
Antioxidant 425*	lb.	2.47	2.50
Antioxidant 2246*	lb.	1.50	1.53
Antox*	lb.	.59	.61
Aranox*	lb.	—	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special*	lb.	.91	.93
B-L-E*	lb.	.57	.59
B-X-A*	lb.	.55	.57
Deenax*	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.86	1.16
Eugenol C-95%*	lb.	2.30	2.50
Flectol H*	lb.	.57	.64
Flexamine*	lb.	.79	.81
Ionol* (dms.)	lb.	.91	.95
Neozone A*	lb.	.64	.66
C*	lb.	.86	.88
D*	lb.	.57	.59
Nevastain A*	lb.	.51	.61
B*	lb.	.51	.70
Nullapon BF-12*	lb.	—	.21½
BF-13*	lb.	—	.25½
BF-78*	lb.	—	.55
BF-Acid*	lb.	—	.85
Octamine*	lb.	.57	.59
Oxidex*	lb.	—	3.60
PDA-10*	lb.	.46	.48
Permalux*	lb.	—	2.25
Polygard*	lb.	.59	.59
Santoflex AW*	lb.	.79	.86
DD*	lb.	.57	.64
75*	lb.	1.01	1.08
Santovar-A*	lb.	1.55	1.57
Santowhite Crystals*	lb.	1.55	1.62
Santowhite L*	lb.	.57	.64
MK*	lb.	1.25	1.32
Powder*	lb.	1.55	1.62
Sequestrene AA*	lb.	.76	.85
NA2*	lb.	.62	.70
NA3*	lb.	.61	.69
Stabilite*	lb.	.55	.57
Alba*	lb.	.74	.79
FLX*	lb.	.76	.78
L*	lb.	.63	.65
White*	lb.	.52	.54
White Powder*	lb.	.41	.43
Stabilizer No. 1*	lb.	1.55	1.80
Stabilizer No. 9-A*	lb.	.80	1.05
Styphen I*	lb.	.51	.55
Sunolite*	lb.	.16	.22
Tannic Acid, Tech.	lb.	.46	.48
Thermoflex A*	lb.	1.05	1.07
V-G-B*	lb.	.75	.77
Wing-Stay S*	lb.	.53	.57

ANTI-SCORCHING AGENTS

Armeen HT*	lb.	.34	.40
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder PD*	lb.	.37	.39
W*	lb.	—	.42
Sodium Acetate 60-62% Crystals	lb.	.08	.08½

ANTISEPTICS AND GERMICIDES

A.P.C. 6901*	lb.	.32	.38
Arquad S*	lb.	.38	.44
Formaldehyde (dms.)	lb.	.06	.076
G-4* (bbls.)	lb.	1.09	1.29
G-11*	lb.	1.98	2.08
Halane*	lb.	.40	.47
Ortho Cresol (26°—27°)	lb.	.14	.16¼
Preventol GD	lb.	—	1.09
Retarder D*	lb.	.42	.50
Vancide	lb.	—	.80

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound*	lb.	5.13	6.50
Webnix 34-L*	lb.	1.25	1.75
69-C*	lb.	1.50	2.25

AROMATICS (DEODORANTS)

Airkem 115*	gal.	—	6.50
122*	gal.	—	6.50
186*	gal.	—	6.50
Alamask AA*	lb.	—	3.00
AF*	lb.	—	2.50
AO*	lb.	—	1.50
AR*	lb.	—	.50
BG*	lb.	—	1.15
BGM*	lb.	—	.60
CY*	lb.	—	2.40
DJ*	lb.	—	3.35
DL*	lb.	—	1.95
H*	lb.	—	5.50
LD*	lb.	—	.75
ND*	lb.	—	2.75
O*	lb.	—	6.50
OS*	lb.	—	5.25
Bouquet 149*	lb.	—	3.00
Coumarin*	lb.	3.60	3.70
Cumodex 19*	lb.	4.75	4.90
188*	lb.	5.75	5.90
198*	lb.	6.75	6.90
Deodorant 65*	lb.	—	1.85
Deodorant L-37*	lb.	2.15	2.25
L-44*	lb.	2.65	2.75
N.L.T.X.*	lb.	1.90	2.00
Deodorant Oil GD 6422*	lb.	1.90	2.20
GD 6423*	lb.	1.60	1.90
GD 6575*	lb.	2.40	2.90
GD 31063*	lb.	2.25	2.75
Ethavan*	lb.	6.20	6.25
Latex Perfume 17326	lb.	—	4.00
18301	lb.	—	3.00
22258	lb.	—	2.50
Naugaromes* (dms.)	lb.	.60	3.00
Neutroleum Delta*	lb.	—	2.60
Gamma*	lb.	—	3.60
Parador A*	lb.	1.80	2.10
C*	lb.	2.00	2.50
E*	lb.	.25	.40
GD 5280*	lb.	2.00	2.50
GD 53481*	lb.	1.70	2.00
Perfume Oil Bouquet Vanilla M*	lb.	1.60	1.70
Rodo No. 0*	lb.	4.00	4.50
No. 10*	lb.	5.00	5.50
Rubbarome* (dms.)	lb.	.60	3.80
Rubber Perfume 12*	lb.	—	4.35
Russian Leather 7*	lb.	—	4.35
Vanillin	lb.	2.75	2.80

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	—	8.00
Better Blend Soda* (c.l., bags)	cwt.	—	2.55
Blowing Agent No. 81105	lb.	.32	.35
Celogen*	lb.	—	1.95
AZ*	lb.	—	1.95
Diazo Amino Benzene	lb.	—	.73
Kempore R	lb.	1.25	1.95
Neo Fat 42-12*	lb.	.10¼	.12¼
Opex 40	lb.	—	.76
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	—	2.40
Sponge Paste*	lb.	—	.20
Unicel ND*	lb.	—	.76
S*	lb.	—	.20
Urea	lb.	.06	.07

BONDING AGENTS

Base 6986*	lb.	.27	.32
Braze*	gal.	6.00	9.00
Chemlok 201, 203, 220, 401, 607	gal.	5.00	24.00
614	lb.	4.35	4.75
Cover Cement*	gal.	2.50	4.00
Durez 12987*	lb.	—	.54
Gen-Tac Latex*	lb.	.70	.75
Hylene M*	lb.	3.50	3.75
M-50*	lb.	1.90	2.15
Penacolite B1A*	lb.	—	.95
R-2710*	lb.	—	.95
Pliobond 20*	gal.	2.91	4.23
30*	gal.	3.65	4.97
Rex Compounds*	gal.	1.30	1.90
Thixons*	gal.	3.30	9.00
Ty-Ply Q (BN & S)*	gal.	6.75	8.00
Tygobond 30*	gal.	5.50	7.45
Vinculux	gal.	—	4.95

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	9.00	11.00
Glacial 99½% (dms.)	lb.	.12	.13
Calcium Nitrate, Tech. Flake	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	—	.095
Zinc Nitrate, Tech. Flake	lb.	—	.20

COLORING AGENTS

Black

Aquablak B*	lb.	.09¾	.10¼
M*	lb.	.10½	.11
R*	lb.	.10¾	.11¼
S*	lb.	.11¾	.12½
Black Shield 4-35* (dms)	lb.	.09	.09½
No. 5	lb.	.10	.10½
No. 6	lb.	.09	.09½
L-1404B	lb.	.10½	.11
Carbon Black—See *Reinforcing Agents*			
Cooke 1026*	lb.	—	2.50
Lampblack No. 10*	lb.	.06	.09
Mapico Black Iron Oxide* (50 lb. bags)	lb.	.14¼	.14½
Pure Black Iron Oxide	lb.	.14¼	.14½

COLORING AGENTS (Cont'd)

Blue

Akron Masterbatches*	lb.	2.23	2.78
Toners*	lb.	2.30	6.35
Blue Powders	lb.	2.20	3.75
Cooke M.B. Blue*	lb.	2.20	3.75
Disco Blues	lb.	2.20	3.45
Monastral Rubber Blue CPL*	lb.	—	1.95
PCD, Dispersed*	lb.	—	2.55
Peacoline Blue*	lb.	—	3.85
Ramapo Blue*	lb.	2.75	3.00
Rubber Blue GD* (Disp.)	lb.	—	4.75
Rubber Blue X-1999*	lb.	—	1.90
Rubber Dispersed Blues	lb.	2.52	2.78
Solfast Sky Blue*	lb.	3.00	3.60
Stan-Tone MBS*	lb.	1.55	4.55
GPE*	lb.	—	2.50
PC*	lb.	1.40	1.80
Ultramarine	lb.	.14	.30
Vansul Blue M.B.*	lb.	.95	2.60

Brown

Brown Iron Oxide	lb.	.15¼	.15½
Mapico Brown* (50 lb. bags)	lb.	.15¼	.15½
Stan-Tone GPE*	lb.	—	3.00
Vansul Brown M.B.* (Organic)	lb.	—	2.15

Green

Akron Masterbatches*	lb.	1.38	3.08
Toners*	lb.	1.35	4.95
Cooke M.B. Green*	lb.	1.60	2.80
1013*	lb.	—	2.80
Disco Greens	lb.	1.55	2.80
Green Powders	lb.	1.35	3.95
Monastral Rubber Green GSD* (Dispersed)	lb.	—	2.80
GSL*	lb.	—	2.20
Permansa Green CP-594*	lb.	—	1.35
Pigment Green B*	lb.	—	1.35
GL-652D*	lb.	.90	1.00
Ramapo Green*	lb.	—	3.50
Rubber Dispersed Greens	lb.	1.23	3.08
Rubber Green FD* (Disp.)	lb.	—	2.05
Rubber Green X-1292*	lb.	—	1.75
Solfast Green*	lb.	—	3.95
Stan-Tone MBS*	lb.	1.55	3.35
GPE*	lb.	3.00	4.50
PC*	lb.	1.70	3.80
Vansul Green M.B.*	lb.	1.05	2.90

Maroon

Akron Masterbatches*	lb.	—	4.10
Toners*	lb.	2.00	4.00
Pyrolux Maroon*	lb.	—	3.65
Vansul Maroon M.B.*	lb.	—	3.35

Orange

Akron Masterbatches*	lb.	2.42	2.77
Toners*	lb.	2.82	4.00
Benzidene Orange	lb.	—	3.10
Cooke MB*	lb.	2.25	2.35
1021*	lb.	—	2.25
Dianisidine Orange*	lb.	—	2.70
Disco Oranges	lb.	2.30	2.85
Mercadium X-2667*	lb.	—	1.64
Molybdate Orange	lb.	—	.48
Oswego Orange X2065*	lb.	—	3.15
Rubber Orange OD* (Disp.)	lb.	—	2.25
Stan-Tone Cadmium Dry*	lb.	2.10	2.20
Cadmium Paste*	lb.	2.47	4.20
GPE*	lb.	1.20	4.35
PC*	lb.	.75	2.75
Vansul Orange M.B.*	lb.	2.40	2.45

Red

Akron Masterbatches*	lb.	1.00	3.53
Toners*	lb.	.88	5.60
Arcturus Reds*	lb.	—	1.20
Antimony Trisulfide	lb.	.72	.78
R.M.P. Sulfur Free*	lb.	—	.78
R.M.P. No. 3*	lb.	—	.72
Brilliant Toning Reds*	lb.	1.65	1.90
Cadmolith Red* (dms.)	lb.	1.94	2.87
Cooke M.B. Red*	lb.	1.05	3.25
1010*	lb.	—	1.75
Disco Reds	lb.	1.05	3.25
Graphic Red* (dlvd.)	lb.	.93	.98
Kroma Reds*	lb.	.14	.15
Lake Red C*	lb.	—	1.20
Mapico Reds* (50 lb. bags)	lb.	.13¾	.14
Mercadium X-2668 Light*	lb.	—	1.73
X-2669 Medium Light*	lb.	—	1.82
X-2670 Medium*	lb.	—	1.90
X-2671 Dark*	lb.	—	2.00
Oximony Red Iron Oxide	lb.	.12¾	.13
Polaris Red*	lb.	—	1.65
Recco Red Oxide*	lb.	.12	.13
Red Iron Oxide, Light	lb.	.13¾	.14
Red Powders	lb.	—	4.40
Rubber Dispersed Reds	lb.	1.47	3.58
Rubber Red PBD* (Disp.)	lb.	—	2.05
2BD, Dispersed*	lb.	—	2.00
2BL*	lb.	—	1.24
PBL*	lb.	—	1.24
Rubanox Reds*	lb.	1.40	1.50
Rubber Red CP-339* (dlvd.)	lb.	—	1.10
Rubber Red X-1148*	lb.	—	.93
Solfast Red*	lb.	1.40	1.50
Stan-Tone MBS*	lb.	1.20	3.53
GPE*	lb.	1.65	2.00
PC*	lb.	1.30	2.50
PDS*	lb.	1.40	1.55
PVC*	lb.	1.65	1.90
Vansul Red M.B.*	lb.	1.00	3.35
Watchung Red*	lb.	1.65	1.90

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The PIGMENT & CHEMICAL CO. Ltd.....Toronto

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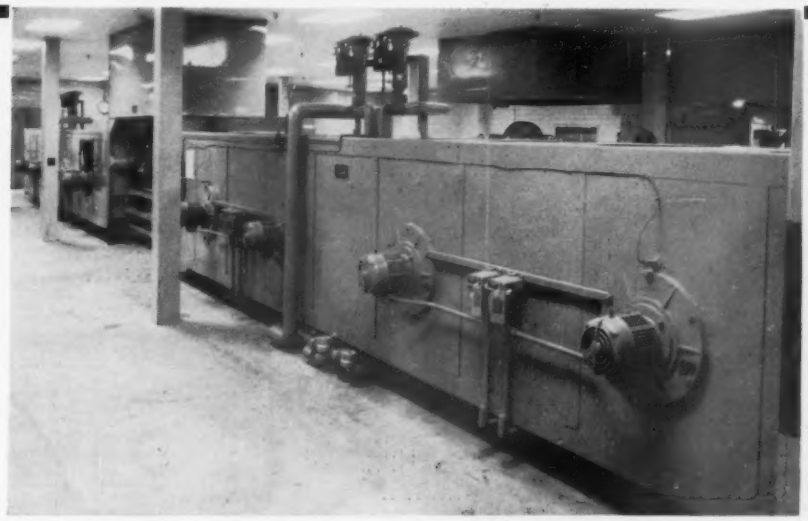

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Special Machinery

LEON MACHINE & ENGINEERING CO.

Beverly, N. J. **Riverside, N. J.**

COLORING AGENTS (Cont'd)

Tan

Mapico Tan 15* (50 lb. bags)	lb.	.22¾ -	.2300
20* (50 lb. bags)	lb.	.22¾ -	.2300

White—Lithopone

Eagle-Picher*	lb.	.0800 -	.0975
Permolith*	lb.	.0837½-	.0912½
Sunolith*	lb.	.0800 -	.0875

White—Titanium Pigments

Horse Head Anatase Grades*	lb.	.25½ -	.26½
Rutile Grades*	lb.	.25½ -	.26½
Stan-Tone PC*	lb.	— -	.55
Ti-Cal*	lb.	.09 -	.09¾
R-22*, R-25*, R-27*, R-30*	lb.	.09⅜ -	.09⅞
R-60*	lb.	.09⅜ -	.10⅛
Ti-Pure*	lb.	.24½ -	.27½
Anatase Grades*	lb.	.25½ -	.26½
Rutile Grades*	lb.	.27½ -	.28½
Titanox A*—all grades (dlvd.)	lb.	.24½ -	.25½
C-50* (dlvd.)	lb.	.13⅜ -	.14⅜
RA* (dlvd.)	lb.	.26½ -	.27½
RA-10* (dlvd.)	lb.	.26½ -	.27½
RA-NC* (dlvd.)	lb.	.26½ -	.27½
RC* (dlvd.)	lb.	.09¼ -	.09¾
RC-HT* (dlvd.)	lb.	.09 -	.09½
Unitane O-110*	lb.	.25½ -	.26½
O-220*	lb.	.25½ -	.26½
O-310*	lb.	.25½ -	.26½
O-410*	lb.	.25½ -	.26½
OR-150*	lb.	.27½ -	.28½
OR-250*	lb.	.27½ -	.28½
OR-340*	lb.	.27½ -	.28½
OR-342*	lb.	.27½ -	.28½
OR-350*	lb.	.27½ -	.28½
OR-540*	lb.	.27½ -	.28½
OR-640*	lb.	.27½ -	.28½
Zopaque*	lb.	.24½ -	.25½
R*	lb.	.26½ -	.27½

White—Zinc Oxide (American Process)

AZO-DOX 44, 45	lb.	.1450 -	.1550
AZO-ZZZ 11* (22*, 33*, 44*, 55*)	lb.	.1450 -	.1550
Eagle-Picher AAA*	lb.	.1450 -	.1550
Horse Head Special*	lb.	.1450 -	.1550
XX*	lb.	.1450 -	.1550
Protox 166*	lb.	.1450 -	.1550
167*	lb.	.1450 -	.1550
267* (pelleted)	lb.	.1450 -	.1550
St. Joe Black Label*	lb.	.1450 -	.1550
Green Label*	lb.	.1450 -	.1550
Red Label*	lb.	.1450 -	.1550
Pelleted	lb.	.1450 -	.1550

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	— -	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1450 -	.1550
Florence Green Seal*	lb.	.1625 -	.1725
Red Seal*	lb.	.1575 -	.1675
White Seal*	lb.	.1675 -	.1775
Kadox 25*	lb.	.1675 -	.1775
15*, 17*, 72* & 515	lb.	.1450 -	.1550
Protox 168*	lb.	.1450 -	.1550
169*	lb.	.1450 -	.1550
268* (pelleted)	lb.	.1450 -	.1550
U.S.P. (cartons)	lb.	.1775 -	.1875
XX-78*	lb.	.1450 -	.1550

White—Zinc Sulfide

Cryptone ZS*	lb.	.2530 -	.2630
Lehigh 35%*	lb.	.1550 -	.1650
50%*	lb.	.1585 -	.1685

Yellow

Akron Masterbatch*	lb.	1.12 -	2.18
Toners*	lb.	2.10 -	6.00
Benzidene-Lightfast	lb.	3.25 -	5.10
Benzidine Yellow	lb.	2.20 -	2.55
Cadmolith Yellow (dms.)	lb.	1.12 -	1.20
Chrome Yellow	lb.	— -	.35
Cooke M.B. Yellow 405*	lb.	2.15 -	2.75
105*	lb.	— -	2.15
Disco Yellows	lb.	2.05 -	3.95
Iron Oxide, Pure			
Light Shades	lb.	.12 -	.12¼
Dark Shades	lb.	.11½ -	.11¾
Mapico Yellow* (50 lb. bags)	lb.	.12 -	.12¼
Rubber Dispersed Yellows	lb.	1.27 -	2.13
Rubber Yellow GD* (disp.)	lb.	— -	2.25
GL*	lb.	— -	1.68
Rubber Yellow X-1940*	lb.	— -	2.35
Stan-Tone Cadmium Dry*	lb.	2.80 -	3.03
Cadmium Paste*	lb.	1.63 -	1.99
MBS*	lb.	1.30 -	2.20
GPE*	lb.	4.25 -	4.50
PC*	lb.	.55 -	3.40
Sumatra Yellow X-1940*	lb.	— -	2.45
Toluidine Yellow	lb.	2.20 -	2.30
YL-660 D*	lb.	1.25 -	1.35
Oximony Iron Oxide	lb.	.12¾ -	.13
Vansul Yellow M.B.*	lb.	1.00 -	2.00
Yellow Powders	lb.	2.00 -	5.00
Zinc Yellow	lb.	— -	.29

DISPERSING AGENTS

Anchoid*(†)	lb.	.24 -	.25
Anhydrapent*	lb.	.56 -	.59
Armeen 18*	lb.	.39 -	.45
Blancol*	lb.	— -	.15¾
Darvan No. 1* (and No. 2*)	lb.	.22 -	.30
Daxad 11* (21*, 23*)	lb.	.08 -	.30
Diethanolamine (dms., dlvd.)	lb.	.24½ -	.27½
Dispersaid*	lb.	1.25 -	1.35
Emcol K-8300* (dms.)	lb.	.14 -	.18
P10-59	lb.	.32 -	—
5120	lb.	.31 -	—
5138	lb.	.31 -	—
Emulphor ON-870*	lb.	— -	.55
Furala*	lb.	.06½ -	.07½
Halloid*	lb.	.04½ -	.05½
Hycryl A-1000*	lb.	.09 -	.09½
Igepal CO-630*	lb.	— -	.29
Igepon T-73*	lb.	— -	.29½
Kyro EO* (dms.)	lb.	— -	.29¾
Leonil SA*	lb.	— -	.55
Lomar PW*	lb.	— -	.18
Marasperse C*	lb.	.06¼ -	.06¾
CB*	lb.	.13 -	.15
N*	lb.	.09½ -	.10½
Monoethanolamine (dms., dlvd.)	lb.	.25 -	.28
Naccotan A*	lb.	.16½ -	.17
Nekal BA-75*	lb.	— -	.40
BX-78*	lb.	— -	.64
Nopco 1187-X*	lb.	.15 -	.16
Pluronic F68*	lb.	.38½ -	.44
Polyfon*	lb.	.08 -	.09
R & R 551*	lb.	— -	.28
Rubbex*	lb.	.247 -	.277
Stablex B*	lb.	.50 -	.95
Stan-Chem BQC*	lb.	.12¼ -	.17¼
1067*	lb.	— -	.13½
1471*	lb.	.1687 -	.2187
2251*	lb.	.12¼ -	.17¼
Trenamine D-25*	lb.	.32½ -	.36
Triethanolamine (dms., dlvd.)	lb.	.22 -	.25
Yelkin TT* (and TTS*)	lb.	.13 -	.16

EXTENDERS

Arceo 1071-13B*	lb.	.14½ -	.15½
1073-18B*	lb.	.13½ -	.14½
1294-36B*	lb.	.11½ -	.12½
Car-Bel-Ex-A* (and B*)	lb.	— -	.14
Extender 600*	lb.	— -	.1765
Facile Gum 4A*	lb.	.48 -	.50
Millex*	lb.	— -	.07
W*	lb.	— -	.07
Nopco 2271*	lb.	.15½ -	.16½
Polyco 418*	lb.	.17 -	.18
PR-162 Latex Extender*	lb.	— -	.182
Solvitose HDF*	lb.	.22 -	.25
Synprolac*	lb.	.16 -	.23
Synprowax*	lb.	— -	.23
Vistanex MM Grades*	lb.	— -	.35

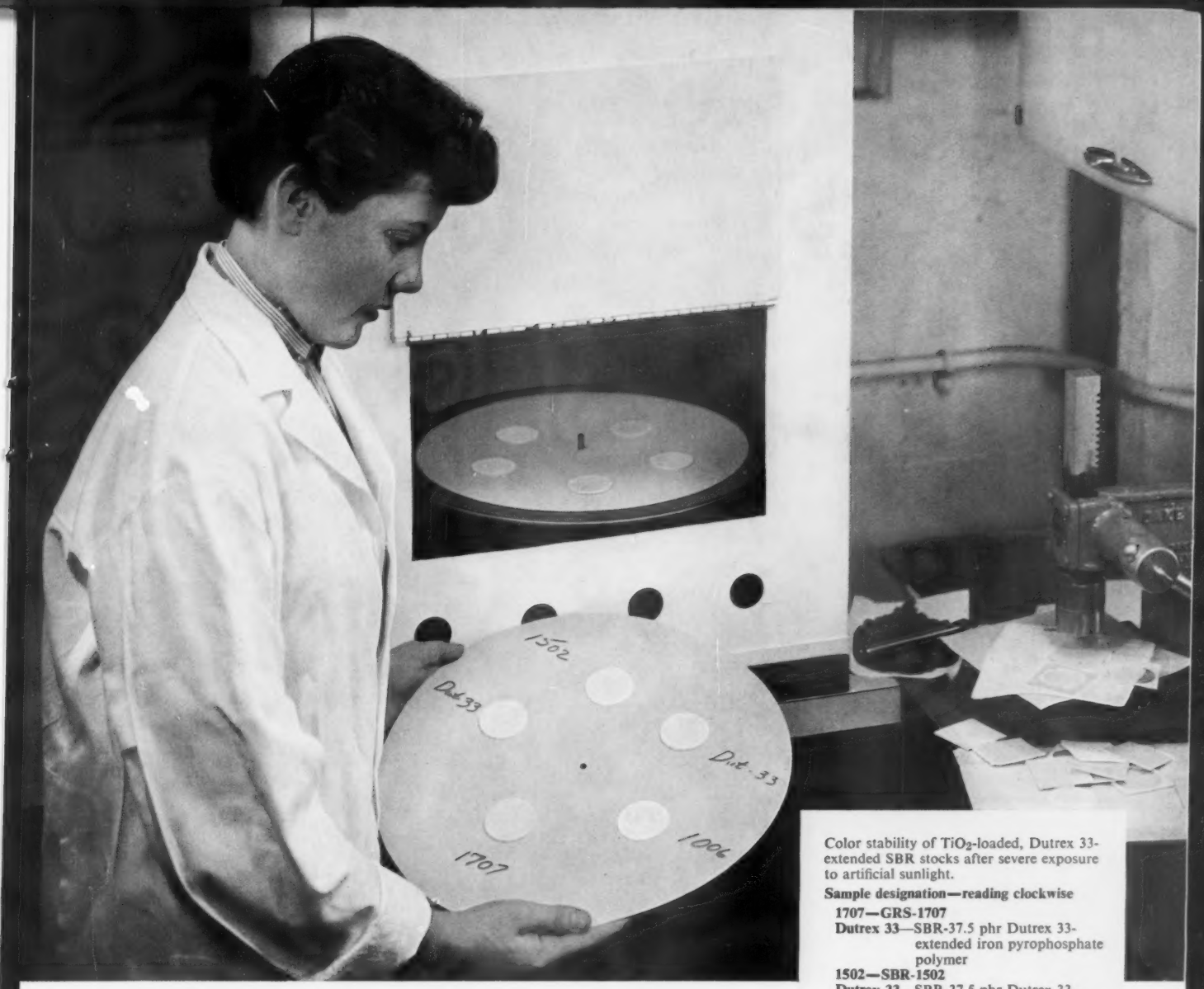
FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite*	lb.	.21½ -	1.35
Lionite*	lb.	.16 -	1.27
Pumice	lb.	.03 -	.05
Walnut Shell Grits	lb.	.05 -	.08
Aluminum Hydrate	lb.	.0850 -	.1200
Kaiser Alumina*	lb.	.026 -	.059
Aluminum Silicate			
AFD*	ton	29.50 -	36.00
Aluminum Flake*	ton	29.50 -	36.00
Marter White*	ton	18.50 -	30.00
Barium Carbonate (l.c.l.)	ton	101.50 -	121.50
Barytes			
No. 1 Floated, White*	ton	45.00 -	65.10
No. 2 Floated, Unbleached*	ton	43.00 -	63.10
No. 22 Barytes* (c.l.)	ton	— -	30.00
No. 3805 Barytes*	ton	22.00 -	26.75
Foam A*	ton	— -	55.00
Sparmite*	ton	80.00 -	85.00
XIOR*	ton	80.00 -	85.00
Bentonite (c.l.)	ton	— -	13.50
Argosite Clay* (c.l.)	ton	— -	12.50
Bennett Clay* (c.l.)	ton	— -	32.50
SPV Volclay* (c.l.)	ton	— -	12.50
White Hi-Gel*	ton	— -	65.90
Blanc Fixe	ton	125.00 -	142.00
Calcium Carbonate			
Atomite* (c.l.)	ton	— -	32.50
B.I. White No. 1 (c.l.)	ton	— -	9.00
Calcene NC*	ton	72.50 -	92.50
TM*	ton	75.00 -	95.00
Calwhite*	ton	— -	20.00
Camel-Carb*	ton	— -	12.00
Camel-Tex*	ton	— -	20.00
Camel-Wite*	ton	— -	32.50
Duramite*	ton	— -	20.00
Gamaco* (c.l.)	ton	— -	32.50
Georgia Marble 5-25* (c.l.)	ton	— -	20.00
No. 10 White* (c.l.)	ton	— -	11.00
Kalite*	ton	50.00 -	65.00
Laminar*	ton	— -	30.00
Lesamite* (c.l.)	ton	— -	27.50
Lorite*	ton	30.00 -	36.00
Millical*	ton	38.00 -	53.00
Multifex MM*	ton	110.00 -	125.00
Non-Fer-Al*	ton	32.50 -	37.50
Purecal M*	ton	56.75 -	80.75
SC* (and T*)	ton	110.00 -	125.00
U*	ton	120.00 -	135.00

FILLERS (Cont'd)

Calcium Carbonate (cont'd)

Rambo No. 1*	ton	— -	16.50
Snowflake*	ton	17.00 -	20.00
Super Multifex*	ton	160.00 -	175.00
Surfex*	ton	37.50 -	52.50
Suspenso*	ton	35.50 -	50.50
Witcarb Reg.*	ton	56.75 -	85.00
P*	ton	110.00 -	140.00
R*	ton	120.00 -	150.00
RC*	ton	110.00 -	140.00
York White*	ton	— -	10.50
Calcium Silicate			
Silene EF*	ton	120.00 -	140.00
Calcium Sulfate, Anhydrous			
Snow White Filler*	ton	— -	21.00
Calcium Sulfate Hydrous			
Terra Alba No. 1*	ton	— -	17.00
Chalk Whiting (l.c.l.)	lb.	.01½ -	.01¾
Recco Paris Whiting*	ton	— -	35.00
OMYA Whiting*	ton	— -	30.00
Clay			
Afton Clay*	ton	12.00 -	35.50
Aiken Clay*	ton	14.50 -	—
Alsilite* (c.l.)	ton	30.00 -	45.00
Aluminum Flake*	ton	25.50 -	28.50
Buca* (c.l.)	ton	— -	45.00
Burgess No. 20*	ton	— -	35.00
No. 30*	ton	— -	37.00
Burgess Iceberg*	ton	— -	50.00
Catalpo* (c.l.)	ton	— -	35.00
Champion*	ton	— -	14.50
Crown*	ton	— -	14.00
Dixie* (c.l.)	ton	— -	14.00
Franklin Clay—R* (c.l.)	ton	15.00 -	39.00
G. K. Soft*	ton	11.00 -	28.00
Harwick Clays*	ton	14.50 -	57.00
Hi-White R*	ton	— -	13.50
Kaolloid Clay* (c.l.)	ton	— -	10.50
LGB*	ton	17.50 -	22.50
LGP*	ton	20.00 -	25.00
McNamee* (c.l.)	ton	— -	13.50
Natka 1200 (c.l.)	ton	— -	13.00
Par* (c.l.)	ton	— -	12.00
Paragon*	ton	14.50 -	19.50
Pigment 5*	ton	27.50 -	34.50
33*	ton	— -	37.00
Recco* (c.l.)	ton	— -	14.00
Swanee Clay*	ton	— -	12.50
Snobrite*	ton	— -	12.50
Suprex*	ton	14.50 -	19.50
Whitetex* (c.l.)	ton	— -	50.00
4200 Clay*	ton	13.00 -	—
Diatomaceous Earth	ton	30.00 -	50.00
Kaylorite* (c.l.)	ton	— -	30.00
Lorite*	ton	— -	36.00
Flock			
Cotton (White)	lb.	.28 -	.32
Colored	lb.	.11 -	.13½
Filfloc F 40-9000*	lb.	— -	.13
F 6000*	lb.	— -	.36
Polycel*	ton	110.00 -	210.00
Rayon, Bleached or Dyed	lb.	.75 -	1.20
Rayon, Grey	lb.	— -	.18
Rayon, Pink	lb.	— -	.20
Solka-Floc* (l.c.l.)	lb.	.07 -	.16
Glue, Amber	lb.	.17 -	.19
Ground Softwood Bark			
Silvacon* (c.l.)	ton	55.00 -	100.00
Leather			
Flour (dust)	lb.	.12 -	.15
Shredded	lb.	.05 -	.17
Lignin	lb.	.06 -	.08
Indulin*	lb.	.06 -	.08
Limestone, Pulverized	ton	3.00 -	5.00
Asbestol Regular*	ton	27.00 -	29.00
Asbestol Superfine*	ton	32.00 -	34.00
Georgia Marble No. 10*	ton	— -	11.00
Industrial Filler No. 100*	ton	— -	5.75
Micro Velva A*	ton	49.00 -	51.00
L*	ton	57.00 -	59.00
No. 1 White*	ton	— -	10.00
Magnesium Carbonate	lb.	.12½ -	.15
K & M Clearcarb*	lb.	— -	.14
Technical* (c.l., eqld.)	lb.	.10½ -	.12
Marinco CL*	lb.	— -	.17
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼ -	.07¾
Concord*	lb.	.08 -	.08¾
Micro-Mica*	lb.	.08 -	.08¾
Mineralite* (c.l.)	ton	40.00 -	85.00
Silversheen*	lb.	.08 -	.08¾
Triple A Mica* (c.l.)	ton	— -	30.00
Vermiculite*	lb.	— -	.11
Wet Ground Biotite Mica	lb.	.06½ -	.07¼
Wet Ground Mica No. 160*	lb.	.08 -	.08¾
Pecan Shell Flour			
Stan Shell*	ton	45.00 -	75.00
Pyrophyllite			
No. 261*	ton	— -	11.50
Pyrax A* (c.l.)	ton	— -	13.50
WA* (c.l.)	ton	— -	16.00
Sawdust, Graded	ton	14.00 -	35.00
Silica	ton	16.00 -	27.00
Extra Fine (bags) (c.l.)	ton	— -	43.00
Slate, Powdered (l.c.l.)	ton	15.00 -	20.00
Lo-Micron Slate Flour*	lb.	— -	.04½
No. 133 Slate Flour*	ton	— -	4.55
Sodium Silico Aluminate			
Zeolex 23*	ton	120.00 -	140.00



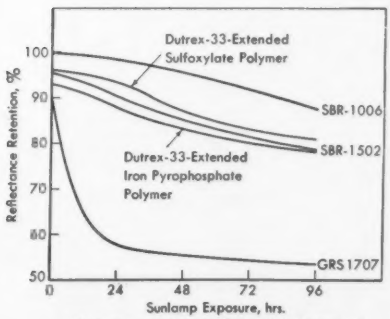
Color stability of TiO_2-loaded, Dutrex 33-extended SBR stocks after severe exposure to artificial sunlight.

Sample designation—reading clockwise

1707—GRS-1707
Dutrex 33—SBR-37.5 phr Dutrex 33-extended iron pyrophosphate polymer
1502—SBR-1502
Dutrex 33—SBR-37.5 phr Dutrex 33-extended sulfoxylate polymer
1006—SBR-1006

Non-staining extending oil

for light-colored rubber stocks



Whiteness retention of TiO_2-loaded, Dutrex 33-extended SBR stocks. (Reflectance retention compared to unexposed S-1006 control.)

Shell Dutrex® 33 is a superior naphthenic extender for SBR combining extremely light color and outstanding color stability with good compatibility and low volatility. This attractive balance of properties now provides practical oil-extended SBR stocks with staining and discoloration resistance approaching the best oil-free SBR types.

The outstanding resistance of Dutrex 33-extended SBR stocks to discoloration by severe sun lamp exposure is shown in the accompanying illustrations. Results indicate that Dutrex 33-extended SBR may serve in some applications where critical discoloration and contact or migration staining resistance have previously demanded use of oil-free types.

For additional information, write or call Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

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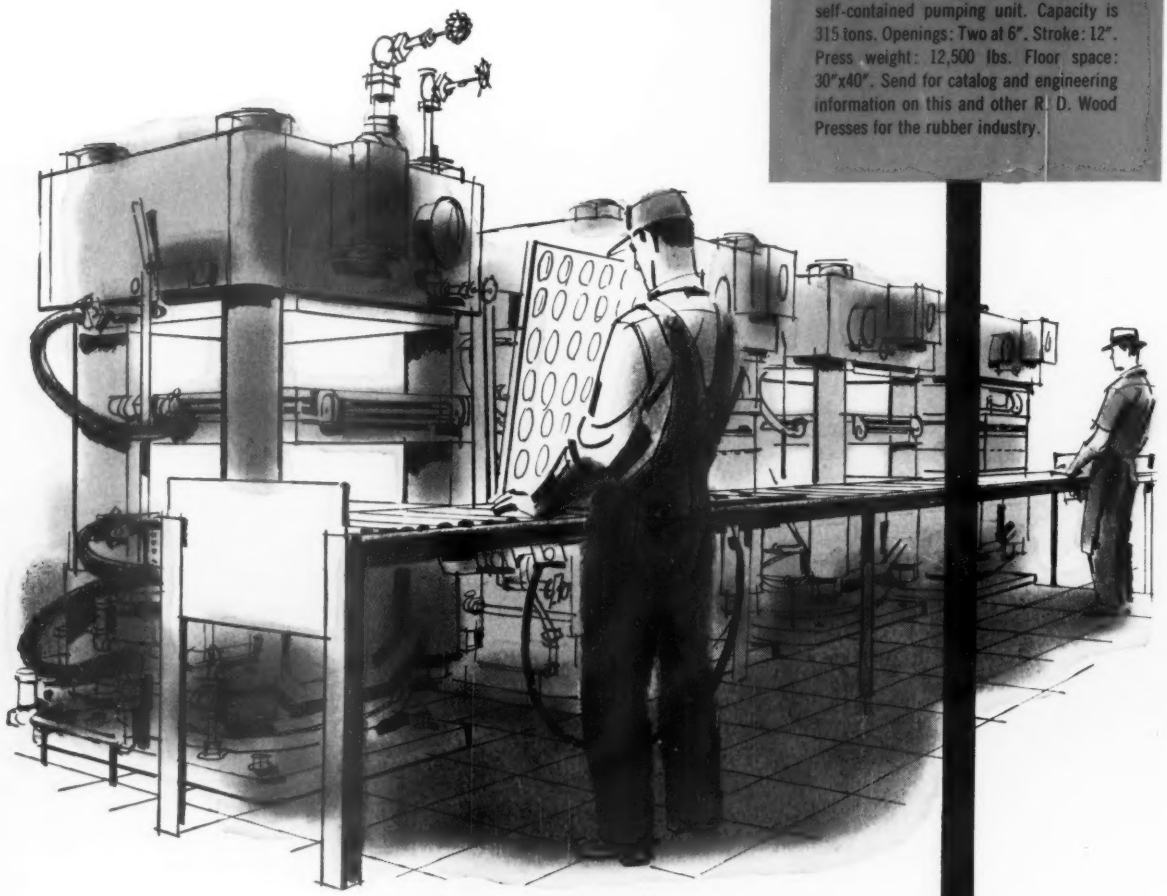
R. D. Wood High-accuracy 24"x24", 2-opening Press for molding rubber products. Can be furnished for operation from a central hydraulic system or with its own self-contained pumping unit. Capacity is 315 tons. Openings: Two at 6". Stroke: 12". Press weight: 12,500 lbs. Floor space: 30"x40". Send for catalog and engineering information on this and other R. D. Wood Presses for the rubber industry.



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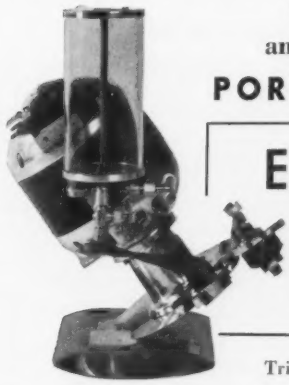

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FILLERS (Cont'd)

Talc (Magnesium Silicate)			
Asbestol Regular*	ton	—	27.00
Eastern RC-500*	ton	—	32.00
No. 41*	ton	—	19.70
No. 549*	ton	—	63.00
French*	ton	—	59.00
L.S. Silver*	ton	33.75	38.75
No. 367*	ton	—	13.00
No. 1600*	ton	—	70.60
No. 1768*	ton	—	13.00
Nytal 200* (c.l.)	ton	—	28.00
300* (c.l.)	ton	—	38.00
Sierra Fibrene C-400*	ton	33.00	38.00
Supreme 325*	ton	46.25	57.25
Sierra White*	ton	20.75	31.75
Soapstone*	ton	—	13.00
Walnut Shell Flour	ton	55.00	100.00
Stan-Shell*	ton	50.00	84.00
Whiting, Commercial	ton	—	7.50
Allied Whiting*	ton	10.50	21.50
Camel-Carb*	ton	—	10.00
Calwhite (c.l.)	ton	—	20.00
C-C-O White*	ton	—	22.00
Georgia Marble No. 15*	ton	—	20.00
No. 16*	ton	—	20.00
Piqua No. 1 YAA* (c.l.)	ton	1.00	10.00
No. 2 LS* (c.l.)	ton	1.00	10.00
Snowflake* (c.l.)	ton	—	20.00
Stan-White 325*	ton	11.50	14.10
Veroc* (c.l.)	ton	—	10.50
Welco* (c.l.)	ton	—	10.50
York White R* (c.l.)	ton	—	10.00
Wood Flour	ton	31.50	48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes*	gal.	2.10	2.35
Black Out*	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.50	.60
VanWax*	gal.	1.45	1.50

FLAME RETARDANTS

Celluflex CEF* (dms.)	lb.	—	.65
Chlorowax 40*	lb.	.15¼	.17¼
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
Halowax*	lb.	.36	.46
Zinc Borate 3167*	lb.	.1920	.2020
Zyrox Compounds*	lb.	.38	.95½

LATEX MODIFIERS

Ludox	lb.	.15	.16¾
OPD-101*	lb.	—	.28
Piccopale A-1 Emulsion	lb.	.086	.107
Ubatol U-2001* (dms.)	gal.	1.84	1.87

LUBRICANTS, MOLD

Akro Gel*	lb.	—	.165
Alipal CO-433*	lb.	—	.20
CO-436*	lb.	—	.24
Aluminum Stearate Crown Brand*	lb.	.37	.42
Amine, Mixed Crude*	lb.	.19	.25
Aquadag*	lb.	3.50	4.00
Aquarex D*	lb.	—	.78
L*	lb.	—	.94
ME*	lb.	—	.80
MDL*	lb.	—	.33
WAQ*	lb.	—	.22
Armeen HT*	lb.	.34	.40
180*	lb.	.52	.56
Armid HT (flaked)*	lb.	.42	.46
0*	lb.	.39	.41
Borax, Granular (l.c.l.)	ton	89.00	94.00
Carbowax 4000*	lb.	.31	.32
CD Mold Release B*	gal.	5.00	—
B-2*	gal.	5.00	—
Colite Concentrate* (dms.)	gal.	.90	1.15
Colite D43D*	gal.	1.15	1.40
Concentrex*	lb.	—	.25
Dag Dispersions No. 197*	lb.	1.85	2.90
D.C. 7 Compound*	lb.	5.13	6.50
D.C. Emulsion No. 7*	lb.	1.59	2.07
No. 8*	lb.	1.22	1.76
No. 35*	lb.	1.22	1.76
No. 35A*	lb.	1.22	1.76
No. 35B*	lb.	1.22	1.76
No. 36*	lb.	1.22	1.76
D.C. Mold Release Fluid*	lb.	3.14	4.75
Dri-Lube*	lb.	—	.22
Emulsion Lubricant A80*	lb.	—	1.80
45*	lb.	—	1.80
G-E Silicone Emulsion SM-55*	lb.	1.22	1.76
SM-61*	lb.	1.22	1.76
SM-62*	lb.	1.22	1.76
G-E Silicone Fluid SF-93*	lb.	3.14	4.25
SF-96*	lb.	3.14	4.25
Glydag G*	lb.	1.30	2.45
Hawkeye Flake* (dlvd.)	lb.	.15	.15¼
HSC No. 35*	lb.	1.22	2.46
No. 515	lb.	1.22	2.46
Igepal CO-430*	lb.	—	.29
CO-630*	lb.	—	.29
CO-530*	lb.	—	.29
Igepon AP-78*	lb.	—	.48
T-33*	lb.	—	.21
T-51*	lb.	—	.13½
Kokobace R*	lb.	.17½	.18½
Lubrex	lb.	.25	.30
Lubri-Flo*	gal.	10.00	12.00
Migralube*	lb.	—	.35
ML-1027-2C*	gal.	—	2.15
ML-1028-2C*	gal.	—	2.15
Mold Lubricant No. 72 Conc.* (dms.)	gal.	—	1.90

LUBRICANTS, MOLD (Cont'd)

Mold Lubricant No. 735* (dms.)	gal.	—	1.25
No. 769* (dms.)	gal.	—	1.20
No. 825* (dms.)	gal.	—	2.00
No. 856* (dms.)	gal.	—	1.90
No. 880* (dms.)	gal.	—	1.19
No. 887* (dms.)	gal.	—	1.80
No. 896* (dms.)	gal.	—	1.28
No. 935* (dms.)	gal.	—	1.56
No. 956* (dms.)	gal.	—	2.50
No. 965* (dms.)	gal.	—	2.15
No. 967* (dms.)	gal.	—	2.40
No. 969* (dms.)	gal.	—	1.50
No. 975* (dms.)	gal.	—	2.85
No. 980* (dms.)	gal.	—	1.53
No. 987* (dms.)	gal.	—	2.45
Moldeze No. 3*	gal.	—	4.95
Mold-Brite*	gal.	—	1.50
Monopole Oil MD*	lb.	—	.16
Olate Flakes*	lb.	.22	.23
Orvus WA Paste* (dms.)	lb.	—	.22
Plaskon Polyethylene S*	lb.	.32	.47
Poly-Brite PE-20	lb.	.28	.42
600	lb.	.42	.58
Poly-Cone 125X	lb.	1.22	1.40
1,000	lb.	.94	1.06
Polyglycol 15-200*	lb.	.25	.28¾
E4000*	lb.	.31	.37
Prodag*	lb.	.28	.42
Purity Flake* (dlvd.)	lb.	.18	.19¾
Rubber-Flo*	gal.	1.25	2.00
Rubber-Glo*	gal.	—	.94
Rusco Mold Paste*	lb.	—	.25
Sericite* (l.c.l.)	ton	65.00	75.00
Silicone Oil A145*	lb.	3.18	3.61
Silrex (dms.)	lb.	—	.65
A65*	lb.	2.50	2.75
Soybean Lecithin	lb.	.13	.17
Thermalube*	lb.	—	.13¾
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-45*	lb.	1.22	1.70
LE-450*	lb.	1.22	1.70
Ucon Lubricants*	lb.	.26¾	.27¾
Ulco Mold Soap*	lb.	.15	.29

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	—	.25
Extrud-o-Lube*	gal.	1.33	1.54
G.B. Naphthenic Neutrals*	gal.	.11	.18
Ivory Chips*	lb.	.18¼	.19¼
Latex-Lube GR* (dlvd.)	lb.	.19¼	.20
No. 82-A* (450 lb. dms.)	lb.	—	.08½
Propylene Stearate (dms.)	lb.	.35	.60

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.41	.46
Calcium Stearate	lb.	.39	.44
Crown Brand*	lb.	.37	.42
D.C. 7 Compound*	lb.	5.13	6.50
D.C. 200 Fluid*	lb.	3.14	4.75
ELA*	lb.	—	.82
G-E Silicone Fluid SF-92*	lb.	3.14	4.25
Glycerized Lubricant*	gal.	1.25	1.48
Glydag B*	lb.	1.50	2.10
G*	lb.	1.30	2.45
Glyso-Lube* (dms.)	lb.	—	.14
No. 3* (dms.)	lb.	—	.14
HSC No. 35*	lb.	1.28	1.34
No. 515*	lb.	1.28	1.34
Hydro-Zinc*	lb.	—	.20
Latex-Lube Pigmented* (dlvd.)	lb.	.17¼	.18¼
R-66*	lb.	—	.16½
Liqui-Lube* (dlvd.)	lb.	—	.16¼
N.F.* (dlvd.)	lb.	—	.16¾
N.T.* (dlvd.)	lb.	—	.16¾
Lubrex*	lb.	.25	.30
Lubri-Cote	gal.	.86	1.00
Magnesium Stearate Crown Brand*	lb.	.40	.45
Polyethylene Glycol	lb.	.22	.26
Rubber Free (Concentrate)*	gal.	—	1.44
Jel*	lb.	.18	.21½
Slab-Dip* (dms.)	lb.	—	.15
Soybean Lecithin	lb.	.13	.17
Stock-Lube*	lb.	—	.19
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-450*	lb.	1.22	1.70
Zinc Stearate	lb.	.41	.46

MOLD CLEANERS

Actusol* (dlvd.)	gal.	1.45	1.65
Alkon* (dlvd.)	lb.	.16	.16½
CA-301*	gal.	—	2.49
CA-302*	gal.	—	2.63
G-O 6910*	lb.	.38	.40
Metso Anhydrous*	cwt.	5.70	7.95
Metso 99*	cwt.	5.00	7.25
200*	cwt.	6.70	8.95
Granular*	cwt.	4.45	6.70
Orvus Extra Granules*	lb.	.22½	.23½
Rubber-Sol*	gal.	2.97	3.97
Sprex A.C.* (dlvd.)	lb.	.17¾	.18¾
Zip Mold Cleaner*	gal.	.95	1.45

PEPTIZING AGENTS

Peptizer P-12*	lb.	.95	1.25
Pepton 22 Plasticizer*	lb.	.83	.86
65*	lb.	1.23	1.26
65B*	lb.	.83	.86

PEPTIZING AGENTS (Cont'd)

RPA 2*	lb.	—	.85
3*	lb.	—	.51
3 Conc.*	lb.	—	.85
5*	lb.	—	.68
6*	lb.	—	1.66

PLASTICIZERS & SOFTENERS

Acto 500*	lb.	—	.09
Adipol BCA*	lb.	.45	.45½
2EH*	lb.	.42½	.43½
10A*	lb.	.42½	.43½
ODY*	lb.	.45½	.46½
810*	lb.	.42½	.45½
XX*	lb.	.42½	.43½
Admex 562 (dms.)	lb.	.50¾	.51¼
710 (dms.)	lb.	.35¾	.36¼
711 (dms.)	lb.	.37¾	.38¼
744 & 745 (dms.)	lb.	.41¾	.42¼
760 (dms.)	lb.	.59¾	.60¼
761 (dms.)	lb.	.46¾	.47¼
Anhydrol 6990*	lb.	.51	.56
Arneel SD*	lb.	.34	.40
Arolene 1980* (c.l.)	lb.	—	.10
Aromatic Plasticizer 10* (and 25*) (dms.)	lb.	.05	.06½
Aromatic Tar	gal.	.0573	.1973
Bardol*	lb.	.02¾	.03¾
B*	lb.	.06¼	.06½
Bayol D*	gal.	—	.382
F*	gal.	—	.52
Beeswax, Bleached	lb.	.76	.79
Yellow Refined	lb.	.68	.70
Bondogen*	lb.	.55½	.60½
B.R.C. No. 20*	lb.	.0150	.0175
No. 21*	lb.	.02¾	.03
No. 22*	lb.	.02½	.02¾
B.R.H. 2*	lb.	.0213	.0351
BRS 700*	lb.	.0200	.0285
B.K.T. 3*	lb.	.0180	.0265
4*	lb.	.0250	.0260
7*	lb.	.0300	.0310
B.R.V.*	lb.	.0475	.0565
Bunarex Resins*	lb.	.07	.08
Bunatak AH*	lb.	—	.09½
N*	lb.	—	.31
U*	lb.	—	.17½
No. 90*	lb.	—	.09
No. 210*	lb.	—	.14
Butac*	lb.	.12½	.13½
Butyl Carbitol Perlargonate (dms.)	lb.	—	.64½
Butyl Cellosolve Perlargonate (dms.)	lb.	—	.68
Butyl Oleate	lb.	.25½	.26½
Butyl Palmitate	lb.	—	.26½
Butyl Stearate (dms.)	lb.	.24½	.25½
BWH-1*	lb.	.16	.17
Cabflex DDA*	lb.	.40	.43½
DDP*	lb.	.29½	.33
Di-BA*	lb.	.41	.44½
Di-OA*	lb.	.40	.43½
Di-OP*	lb.	.28½	.32
Di-OZ*	lb.	.45½	.49
DOA*	lb.	.40	.43½
DOP*	lb.	.28½	.32
HS-10	lb.	.44	.47½
ODA*	lb.	.40	.43½
ODP*	lb.	.29	.32½
TCP*	lb.	.34½	.38
Califlux 510* (and 550*)	lb.	.03½	.03¾
G.P.*	lb.	.02¼	.02½
R-100*	lb.	.05½	.05¾
TT*	lb.	.0270	.0295
Candelilla Wax, Prime	lb.	.70	.74
Refined Light	lb.	.73	.78
Carbowax 4000* (dms.)	lb.	.31	.32
Carnauba Wax, Crude	lb.	.71	.77
Flaked	lb.	.72	1.55
Refined, Technical	lb.	.72	.80
Refined, Pure	lb.	.80	.86
Yellow	lb.	1.42	1.45
Celluflex* (dms.) 112* (t.c., dlvd.)	lb.	—	.34½
179-A* (t.c., dlvd.)	lb.	—	.32½
179-C* (t.c., dlvd.)	lb.	—	.32½
179-EG* (t.c., dlvd.)	lb.	—	.32½
DBP* (t.c., dlvd.)	lb.	—	.30
DOP* (t.c., dlvd.)	lb.	—	.28½
TPP* (dms., eqld.)	lb.	—	.40
Ceresin Wax	lb.	.12	.30
Chlorowax 40*	lb.	.15¼	.17¼
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
LV*	lb.	.17¼	.19¼
CTLA Polymer*	gal.	.20	.36
Cumar Resins*	lb.	.07	.19
Darex DBP*	lb.	.30	.33
DOP*	lb.	.30½	.33½
DIOP*	lb.	.30½	.33½
D.B.M.*	lb.	.32	.34¾
Decylbutyl Phthalate	lb.	.27	.29½
Degras, Common	lb.	—	.14
Diallyl Phthalate	lb.	.51½	.52½
Dibenzyl Sebacate	lb.	.88	.89½
Dibutoxyethyl Sebacate	lb.	—	.56¾
Dibutyl Phthalate	lb.	.30	.33½
Dibutyl Sebacate	lb.	.64½	.66
Dicapryl Adipate	lb.	.42	.44
Dicapryl Phthalate	lb.	.29½	.31
Dicapryl Sebacate	lb.	.58	.59½
Di-Carbitol Phthalate (dms.)	lb.	.47	.47½
Dicyclohexyl Phthalate	lb.	.58¾	.59¼
Diethyl Phthalate (t.c.)	lb.	.25	.27¾
Di-2-ethylhexyl Phthalate	lb.	—	.30½
Dihexyl Adipate	lb.	.40	.42½
Dihexyl Phthalate	lb.	.30	.32½

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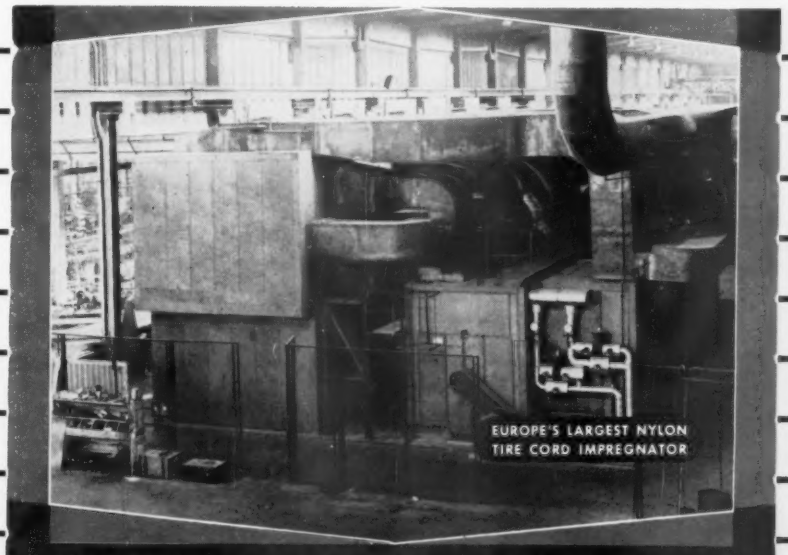

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. . . WORLD-WIDE SERVICE . . .

TECHNICAL DATA ON REQUEST: VARNISH, LATICE & RUBBER IMPREGNATION OF FABRICS & PAPERS

C. A. LITZLER CO., INC.

1817 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"

EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.

PLASTICIZERS & SOFTENERS (Cont'd)

Dihexyl Sebacate	lb.	.65	.74
Diisobutyl Azelate	lb.	——	**.47¾**
Di-iso-octyl Adipate	lb.	.40	.43½
Di-iso-octyl Phthalate t.c.)	lb.	.28	.31½
Dimethyl Phthalate (t.c.)	lb.	.27½	**.30¼**
Dimethyl Sebacate	lb.	1.30	1.39
Dinonyl Adipate	lb.	.44½	**.47½**
Dinopol 235*	lb.	.36	.37
IDO*	lb.	.31	.32
MOP*	lb.	.33½	.34½
Dioctyl Adipate	lb.	.40	.42½
Dioctyl Phthalate (dms.)	lb.	.28	.31½
Dioctyl Sebacate (dms.)	lb.	.60	.63
D.I.O.P. (dms.)	lb.	.31	.32
Dipolymer Oil	gal.	.33	.48
Dispersing Oil No. 10*	lb.	.06	**.06¼**
Dutrex 6*	gal.	——	.11
15E*	gal.	——	.10
Elastex 10-P*	lb.	.30½	**.33½**
50-B*	lb.	.25	**.28**
DCHP*	lb.	.59	.60
Emulphor EL-719*	lb.	——	.58
Epoxy Plasticizer	lb.	.33½	.36
Drapex 3.2*	lb.	.39¼	.44
Drapex 4.4*	lb.	.37	.42
Esparto Wax	lb.	——	.55
Estac*	lb.	——	.16
Facile Gum 4A*	lb.	.48	.50
Flexol B-400*	lb.	.27½	**.28½**
DOP*	lb.	.33	.34
TOF*	lb.	.45½	.46½
3GH*	lb.	.46	.46¾
3GO*	lb.	.55	.55¾
4GO*	lb.	.35	.36
426*	lb.	.29½	.30½
Flexricin P-1*	lb.	——	**.32**
P-4*	lb.	——	.34¾
P-6*	lb.	——	.41½
P-8*	lb.	——	.34¾
Fortex A* (dms.)	lb.	.12½	.14½
Galex W-100*	lb.	.15½	**.19¼**
G.B. Asphaltic Flux*	gal.	.23	.25
G.B. Light Process Oil*	lb.	.0157	.0177
Medium Process Oil*	lb.	.03½	.03¾
G.B. Naphthenic Neutrals*	lb.	.04½	.04¾
Good-rite GP233*	lb.	.40	.43½
GP235*	lb.	.40	.43½
GP236*	lb.	.40	.43½
GP261*	lb.	.28	.31½
GP265*	lb.	.28½	.32
GP266*	lb.	.29	.32½
GP-266-BPA*	lb.	.29	.32½
Harflex 500* (dms.)	lb.	.31½	.34
HB20*	lb.	.15	.17
HB40*	lb.	.19	.22
Herron-H.T.*	gal.	.16	.27
Herron-Plas*	lb.	——	**.03¾**
Herron-Wax*	lb.	.05¼	.06
No. 23*	lb.	.08¼	**.08¾**
No. 24*	lb.	.07¼	**.07¾**
HSC No. 13*	lb.	.25	.32
No. 28 and 38*	lb.	.20	.27
Indonex 632½* (633½*, 634½*, 637½*)	gal.	.12	.19
Isooctyl Decyl Phthalate	lb.	.28½	.32
Kapsol*	lb.	.35	**.35½**
Kenflex*	lb.	.18	.27
Kesscoflex 101* (dms.)	lb.	——	.37½
103* (dms.)	lb.	——	.38
MCO* (dms.)	lb.	——	.35½
BCL* (dms.)	lb.	——	.37½
MCP* (dms.)	lb.	——	.41
BCP* (dms.)	lb.	——	.36
KP 23*	lb.	.31½	.32½
90*	lb.	.42½	.43½
140*	lb.	.48	.48½
201*	lb.	.58	.59
220*	lb.	.34½	.35½
555*	lb.	.56½	.57
Kremol 40*	gal.	.36	.46
50*	gal.	.39	.49
Kronisol* (dms.)	lb.	.33	.36
Kronitex AA* (dms.)	lb.	.35	.36
I* (dms.)	lb.	.35	.36
K-3*	lb.	.35	.36
MX*	lb.	.35	.36
Lanolin, Tech. Anhydrous	lb.	——	.26
Latex-Lube G.R.*	lb.	.19¼	.20
Lead Oleate	lb.	——	.29¾
Lindol* (dms., t.c.)	lb.	——	.32½
Locusol No. 1-6980*	lb.	.30	.34
2-Mercaptoethanol (dms.)	lb.	1.25	1.50
Methox*	lb.	.40½	.41
Methyl Laurate	lb.	.25	.27
Methyl Oleate	lb.	——	.20
Methyl Stearate (dms.)	lb.	——	.30
Monoplex DOS*	lb.	.59½	.60½
DBS*	lb.	.65½	.66½
S-70*	lb.	.41	.42
S-71*	lb.	.46½	.47½
Montan Wax, Crude	lb.	.26	.35
Flaked	lb.	.29	.40
Morflex*	lb.	.32	.69½
MR 2088* (dms.)	lb.	——	.19
Natac*	lb.	.12	.13
Nebony Resins* (dms.)	lb.	.04½	.05
Neolene 210* (t.c.)	lb.	——	.16
212* (t.c.)	lb.	——	.14
220* (t.c.)	lb.	——	.15
Nerium*	lb.	——	.09
Nevillac Resins* (dms.)	lb.	.31	.85
Neville LX-880* (dms.)	lb.	.12	.13½
LX-685* (dms.)	lb.	.12½	.17½
Neville Resins* (dms.)	lb.	.07¼	.20
Nevindene Resins* (dms.)	lb.	.16½	.20
Nevinol* (dms.)	lb.	——	.24

PLASTICIZERS & SOFTENERS (Cont'd)

Nuba 1* (and 2*) (dms.)	lb.	.06¼	.06¼
No. 480 Oil Proof Resin*	lb.	——	.18
Ohopex Q10* (dms.)	lb.	.32	.33
R9* (dms.)	lb.	.37¼	.37¾
Ortho-Nitrobiphenyl	lb.	.13	.15
Ozokerite Wax, White and Yellow	lb.	.24	.31
Paradene Resins (dms.)	lb.	.07¼	.08
No. 2 Flaked	lb.	.08	.08½
Para Flux* (dms.)	gal.	.22	.25
2016* (dms.)	gal.	.22	.26
Para Lube* (l.c.l.)	lb.	.046	.048
Paraplex G-25*	lb.	.76	.77
G-40*	lb.	.50	.51
G-50*	lb.	.40¾	.41¾
G-53*	lb.	.45	.46
G-60* (and G-61*)	lb.	.35	.36
G-62*	lb.	.37	.38
Parmo*	lb.	.06	.13½
Pepton 22 Plasticizer*	lb.	.81	.84
PG-16*	lb.	——	.35
Philrich-5* (t.c.)	gal.	——	.11
Picco 10* (and 25*)	lb.	.15	.17
60* (and 75*)	lb.	.15	.17
100*	lb.	.15	.17
Piccocizer 30*	lb.	.05½	.07
Piccolastic A* (B*, C*, D* & E*)	lb.	.28	.29
FT* (FHF* & FX*)	lb.	.1815	.1965
T-135*	lb.	.22¾	.23¼
Piccolyte S Resins*	lb.	.20½	.22¾
Piccopale Resins*	lb.	.12	.13
Piccoumaron Resins*	lb.	.07	.24½
Pigmentar*	lb.	.0460	.0634
Pigmentarol*	lb.	.0460	.0634
Plastac M*	lb.	——	.09¼
Plasticizer 2286*	lb.	——	.26¼
Plasticizer 4141*	lb.	.42½	.43½
Plasticizer DP-200, DP-250, DP-520*	lb.	.42¼	.46¼
Plasticizer LP*	lb.	——	.07
Plasticizer MP*	lb.	——	.08
Plasticizer MT-511*	lb.	——	.68¾
Plasticizer ODN*	lb.	.35	.41
Plasticizer SC*	lb.	.42½	.43½
Plasticizer W-13*	lb.	.37	**.38¾**
Plastoflex 3*	lb.	——	.52
52*	lb.	.37¾	.38¾
VS*	lb.	.41¾	**.42¾**
Plastogen*	lb.	.08¾	.09
Plastolein 9050* (c.l.)	lb.	.54½	.56½
9055*	lb.	.30½	.32½
9058*	lb.	.48	.50
9250*	lb.	.38¼	.40¼
9715*	lb.	.39	.40
Plastone	lb.	.23	.27
Polycizer 162*	lb.	.28	.31½
332*	lb.	.40	.42½
562*	lb.	.28½	.32
662*	lb.	.29	.32½
532 and 632*	lb.	.40	.42½
ED*	lb.	——	.51
Polyco 438*	lb.	**.34**	.35
Polymel C-130*	lb.	.13¾	.14¾
D*	lb.	.22½	.23½
6*	lb.	.05¾	**.07¾**
Poly-Sperse AP-2	lb.	.23	.29½
AP-300, LC-20	lb.	.26	.32½
Process Oil C-255* (c.l.)	gal.	.27½	.29½
Propylene Stearate (dms.)	lb.	——	**.32**
FRR 1*	gal.	.15	.35
PT 67 Light Pine Oil* (dms.)	gal.	——	.60
101 Pine Tar Oil* (t.c., dms.)	gal.	.0460	.0634
400 Pine Tar* (600* & 800*) (t.c., dms.)	lb.	.0460	.0634
PX-104*	lb.	.30	.32½
PX-108*	lb.	.30½	.33
PX-138*	lb.	.32½	**.33½**
PX-208*	lb.	.44½	.45½
PX-238*	lb.	.44½	**.45½**
PX-404*	lb.	.66	.67
PX-438*	lb.	.60	.61
PX-800*	lb.	.34	.35
PX-917*	lb.	.36½	.37½
Reogen*	lb.	.14¼	.14½
465 Resin* (dms.)	lb.	.07½	.08
Resin C*	lb.	.0225	.0310
Resinex*	lb.	.03¼	.04¾
L-4*	lb.	.02¼	.03¼
Rexflex*	lb.	——	.15
Rosin Oil	gal.	.80	1.35
RR-10 (Neoprene)*	lb.	——	.37
R.S.O. Softening Oil*	lb.	.03	.05
RuBars*	lb.	.19¼	.20
Rubberol*	lb.	.18	.25¾
Santicizer B-16*	lb.	.48¾	.49¾
E-15*	lb.	.52¾	.53¾
M-17*	lb.	.44¾	.45¾
No. 140*	lb.	.32½	.36
No. 141*	lb.	.36	**.37**
No. 160*	lb.	.28½	.29½
No. 602*	lb.	——	.30½
No. 603*	lb.	——	.27
Sherolatum*	lb.	.03½	.06
Staflex DBES*	lb.	.58	.60½
DOS*	lb.	.58	.60½
IXA*	lb.	.32	.35
KA*	lb.	.36	.38¾
Stan Chlor Oils*	lb.	.13½	.20½
70*	lb.	.17½	.30
Stanolind Petrolatum*	lb.	.07	.156
Wax*	lb.	.31	**.33**
Sunny South Burgundy Pitch*	lb.	.1030	.1085
Rosin Oil*	gal.	.58	.76

PLASTICIZERS & SOFTENERS (Cont'd)

Superla Wax*	lb.	.30	**.397**
Syncera Wax*	lb.	.16	.267
Syn Tac* (c.l.)	gal.	——	**.33**
Synthetic Revertant Oil	lb.	——	**.16**
Tar, Refined	gal.	.1200	**.1760**
Tarpine	lb.	.035	.050
Terpene A*	gal.	——	**.65**
TP-90B*	lb.	.59	.69
TP-95*	lb.	.65	.73
Transphalt Resins*	lb.	.03¾	.05¼
Tributyl Phosphate	lb.	.52½	.53½
Tricresyl Phosphate	lb.	.32½	.36
Turgum S*	lb.	.10¾	**.11¾**
Vanadiset B*	lb.	.036	.07
C*	lb.	.031	.06
MR 80 Mesh*	lb.	.08½	.12½
Vistac No. 1*	gal.	1.00	1.21
P*	lb.	.18	**.18½**
Vopcolene 50*	lb.	——	.31
Witcizer 100*	lb.	.20¼	.21¼
200*	lb.	.20¼	.21¼
201*	lb.	.22¾	.25¼
300*	lb.	.30	.33½
312*	lb.	.30½	.34
313*	lb.	.30½	.34
412*	lb.	.42½	.46
Witresin*	ton	——	52.50

PROCESSING AIDS

Castor Oil, Blown (dms.)	lb.	——	**.21**
Refined (dms.)	lb.	——	**.18½**
Castorwax*	lb.	——	**.24½**
Dutrex 7*	lb.	.12	.20
ELA*	lb.	——	.82
Hydrofol Glycerides 200*	lb.	.15½	.19¾
Kenflex N*	lb.	——	.18
Maleic Anhydride	lb.	——	.27
Millrex*	lb.	——	**.15**
Nadic Anhydride	lb.	——	.75
Polycin*	lb.	——	**.24½**
Resin No. 510*	lb.	.19	.26
No. 529*	lb.	.25	.32
Pulverized*	lb.	**.20½**	**.25**
Thiomalic Acid	lb.	——	3.50
Zyrox*	lb.	.78	.88

PROTECTIVE & STABILIZING AGENTS

Acacia*	lb.	.12¾	**.21**
Alcogum*	lb.	.08½	.24
Alpha Protein	lb.	——	**.23**
Aroostoocrat*	lb.	——	**.07½**
Carob Bean Flour	lb.	——	.50
Casein	lb.	.32	**.38**
Emcol K-8300* (dms.)	lb.	.14	.18
Ethylene Diamine 68%	lb.	**.44**	**.47**
Gum Arabic	lb.	——	.23
Karaya Gum	lb.	——	.35
Locust Bean Gum	lb.	——	.50
Prosein*	lb.	——	**.06**
Stablex B*	lb.	**.50**	**.95**
K*	lb.	.27	.35

RECLAIMING AGENTS

Amalgamator Z-4*	lb.	.32	.33
Armeen C*	lb.	.46	.52
Mixed Crude*	lb.	.19	.25
T*	lb.	.32	.38
Burco RA*	lb.	.051	.081
C-6 Oil* (28* & 32*)	gal.	**.33**	**.38**
C-10 Oil*	gal.	**.25**	**.30**
C-33* (t.c.)	gal.	——	**.21½**
C-42* (t.c.)	gal.	——	**.23**
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	——	4.50
Liquid 50% (t.c.)	cwt.	——	2.80
Solid 76% (c.l., dms.)	cwt.	——	4.10
Cresylic Acid (99-100%)	gal.	.85	1.39
D-4* (t.c.)	gal.	——	**.27**
E-5* (t.c.)	gal.	——	**.25**
Flake Calcium Chloride (77-80%)	ton	——	29.00
G.B. Reclaiming Oil*	gal.	.19½	.21½
CD-10*	gal.	.17½	.19½
CD-50-U*	gal.	.25½	.27½
Gensol No. 6* (t.c.)	gal.	——	**.40**
Heavy Aromatic Naphtha	gal.	.13¼	.18½
LX-77 Reclaiming Solvent*	gal.	.21	**.33**
LX-572 Reclaiming Oil*	gal.	.27	.32
LX-777 Reclaiming Oil*	gal.	.23	**.33**
Neo-Fat D-242*	lb.	**.05½**	**.07¾**
42-70*	lb.	.08¼	.10¼
No. 517 H.B. Oil*	gal.	.11½	.16½
535*	gal.	.22	**.27**
Pitt-Consol "500" (dms.)	lb.	.30	.30½
PT 67 Light Pine Oil* (dms.)	gal.	——	**.60**
PT 101 Pine Tar Oil* (t.c., dms.)	gal.	.0460	.0634
PT 150 Pine Solvents* (dms.)	gal.	——	**.44**
Q Oil* (t.c.)	gal.	——	**.286**
Reclaiming Oil 3186-G*	gal.	.26	.33
Reclaiming Reagent No. 1431*	lb.	.21	**.25**
R.P.A. No. 3*	lb.	——	**.47**
RR-10*	lb.	——	.37
Soda Ash (c.l., bags)	cwt.	——	1.75
Solvent 534*	gal.	**.20½**	**.26½**
Solvent Oil 21*	gal.	**.24**	**.29**
C-42*	gal.	.23	.38
X-1 Resinous Oil*	lb.	.0225	.0325

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REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98*	lb.	.0775 -	.1450
Continental F*	lb.	.0775 -	.1450
Croflex*	lb.	.0775 -	.1450
Dixiedensed (and S)*	lb.	.0775 -	.1450
Kosmobile (and S)*	lb.	.0775 -	.1450
Micronex HPC*	lb.	.0775 -	.1450
Witco No. 6*	lb.	.0775 -	.1450

Channel, Medium Processing (MPC) (bags)

Arrow MPC*	lb.	.0775 -	.1350
Atlantic MPC-95*	lb.	.0775 -	.1450
Continental A*	lb.	.0775 -	.1450
Croflex TH*	lb.	.0775 -	.1450
Dixiedensed HR (and S-66)	lb.	.0775 -	.1450
Kosmobile HM (and S-66)	lb.	.0775 -	.1450
Micronex Standard*	lb.	.0775 -	.1450
Spheron 6*	lb.	.0775 -	.1450
Texas M*	lb.	.0775 -	.1450
Witco No. 1*	lb.	.0775 -	.1450

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42*	lb.	.0775 -	.1450
Collocarb*	lb.	.0590 -	.1400
Continental AA*	lb.	.0775 -	.1450
Croflex 77*	lb.	.0775 -	.1450
Dixiedensed 77*	lb.	.0775 -	.1450
Kosmobile 77*	lb.	.0775 -	.1450
Micronex W-6*	lb.	.0775 -	.1450
Spheron 9*	lb.	.0775 -	.1450
Texas E*	lb.	.0775 -	.1450
Witco No. 12*	lb.	.0775 -	.1450
Wyex EPC*	lb.	.0775 -	.1350

Channel, Conductive (CC) (bags)

Continental R-40*	lb.	.2600 -	.3400
Dixie 5 Dustless*	lb.	.1350 -	.2100
Dixie Voltex*	lb.	.2600 -	.3400
Kosmink Dustless*	lb.	.1350 -	.2100
Kosmos Voltex*	lb.	.2600 -	.3400
Spheron C*	lb.	.1800 -	.2400
Voltex*	lb.	.2600 -	.3400

Channel, Surface Treated (STC) (bags)

Texas 109*	lb.	.0840 -	.1475

Conductive Furnace Black (CF) (bags)

Aromex CF*	lb.	.0875 -	.1450
Atlantic CF*	lb.	.0875 -	.1450
Continex CF*	lb.	.1050 -	.1550
Croflex CF*	lb.	.0875 -	.1450
Dixie CF*	lb.	.0875 -	.1450
Kosmos CF*	lb.	.0875 -	.1450
Shawinigan Acetylene Black*	lb.	—— -	.1900
Vulcan C*	lb.	.1100 -	.1750

Extra-Conductive Furnace Black (ECF) (bags)

Vulcan XC-72	lb.	.1775 -	.2700

Furnace, Fast Extruding (FEF) (bags)

Arovel FEF*	lb.	.0675 -	.1250
Continex FEF*	lb.	.0675 -	.1250
Croflex 50*	lb.	.0675 -	.1250
Dixie 50*	lb.	.0675 -	.1250
Kosmos 50*	lb.	.0675 -	.1250
Philblack A*	lb.	.0675 -	.1200
Statex M*	lb.	.0675 -	.1250
Sterling SO*	lb.	.0675 -	.1250

Furnace, Fine (FF) (bags)

Statex B*	lb.	.0725 -	.1300
Sterling 99*	lb.	.0725 -	.1300

Furnace, General Purpose (GPF) (bags)

Arogen GPF*	lb.	.0600 -	.1175
Dixie 35*	lb.	.0600 -	.1175
Kosmos 35*	lb.	.0600 -	.1175
Sterling V*	lb.	.0600 -	.1175
V (Non-Staining)	lb.	.0600 -	.1175

Furnace, High Abrasion (HAF) (bags)

Aromex HAF*	lb.	.0775 -	.1350
Continex HAF*	lb.	.0775 -	.1350
Croflex 60*	lb.	.0775 -	.1350
Dixie 60*	lb.	.0775 -	.1350
Kosmos 60*	lb.	.0775 -	.1350
Philblack O*	lb.	.0775 -	.1300
Statex R*	lb.	.0775 -	.1350
Vulcan 3*	lb.	.0775 -	.1350

Furnace, High Modulus (HMF) (bags)

Continex HMF*	lb.	.0675 -	.1200
Croflex 40*	lb.	.0675 -	.1250
Dixie 40*	lb.	.0675 -	.1250
Kosmos 40*	lb.	.0675 -	.1250
Modulex HMF*	lb.	.0625 -	.1200
Statex 93*	lb.	.0675 -	.1200
930*	lb.	.0675 -	.1200
Sterling L*	lb.	.0675 -	.1200
LL*	lb.	.0675 -	.1200

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF*	lb.	.0575 -	.1150
Croflex 20*	lb.	.0575 -	.1150
Dixie 20*	lb.	.0575 -	.1150
Essex SRF*	lb.	.0575 -	.1150
Furnex*	lb.	.0575 -	.1150
Gastex*	lb.	.0525 -	.1200
Kosmos 20*	lb.	.0575 -	.1150
Pelletex*	lb.	.0525 -	.1100
NS*	lb.	.0525 -	.1100
Shawinigan Acetylene Black*	lb.	—— -	.1900
Sterling NS*	lb.	.0575 -	.1150
R*	lb.	.0625 -	.1250
S*	lb.	.0575 -	.1150

Furnace Super Abrasion (SAF) (bags)

Dixie 85	lb.	.1150 -	.1650
Kosmos 85	lb.	.1150 -	.1650
Philblack E*	lb.	.1150 -	.1550
Vulcan 9*	lb.	.1150 -	.1800

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Aromex ISAF*	lb.	.0925 -	.1500
Continex ISAF*	lb.	.0925 -	.1500
Dixie 70*	lb.	.0925 -	.1500
Kosmos 70*	lb.	.0925 -	.1500
Philblack I*	lb.	.0925 -	.1450
Statex 125*	lb.	.0925 -	.1500
Vulcan 6*	lb.	.0925 -	.1500

Furnace, Super Conductive (SCF) (bags)

Vulcan SC*	lb.	.1800 -	.2450

Thermal, Fine (FT) (bags)

P-33 (c.l.)*	lb.	—— -	.0575
Sterling FT (c.l.)*	lb.	—— -	.0575

Thermal, Medium (MT) (bags)

Shellblack*(†)	lb.	—— -	.0250
Sterling MT (c.l.)*	lb.	—— -	.0400
MT Non-Staining (c.l.)*	lb.	—— -	.0500
Thermax (c.l.)*	lb.	—— -	.0400
Stainless (c.l.)	lb.	—— -	.0500

REINFORCING AGENTS—SILICA

Cab-O-Sil (compressed)*	lb.	.68 -	.75
Cab-O-Sil (uncompressed)*	lb.	.68 -	.75
D. C. Silica (pelletized)*	lb.	1.45 -	1.65
Hi-Sil 101*	lb.	.14 -	.15½
233*	lb.	.09 -	.10½
X303*	lb.	.40 -	.45
Santocel*	lb.	.62 -	.64
Valron Estersil*	lb.	2.00 -	2.25

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac*	lb.	.50 -	.60
Darex Copolymer No. 3*	lb.	.47 -	.49
43G*	lb.	.39 -	.41
Darex Copolymer Latex No. 3-L	lb.	.41½ -	.46
Durez 12687 (and 12707)*	lb.	—— -	.38½
Durez 13355*	lb.	—— -	.30
Good-rite Resin 2007*	lb.	—— -	.41
Hystron*	lb.	.39 -	.41
Kralac A-EP*	lb.	.39 -	.41
Lamplack	lb.	—— -	.12
Marbon S and S-1*	lb.	.39 -	.41
8000*	lb.	.39 -	.41
Marmix*	lb.	.39 -	.41
Pliolite Latex 150*	lb.	.35 -	.39
Pliolite Resin-Rubber Masterbatches*	lb.	.33 -	.57
Pliolite NR*	lb.	.93 -	.95
S6B*	lb.	.36 -	.43
Plio-Tuf G85C*	lb.	.52 -	.54
Polyco 220*	lb.	.18¼ -	.19¼
Polypol S-70*	lb.	.22 -	.23

RETARDERS

Benzoic Acid TBAO-2*	lb.	—— -	.44
Dutch Boy Normasal*	lb.	—— -	.46
ESEN*	lb.	.35 -	.37
Good-rite Vultrol*	lb.	.62 -	.64
Harcopol 1183*	lb.	.70 -	.74
Retarder J*	lb.	.62 -	.64
PD*	lb.	.37 -	.39
W*	lb.	—— -	.42
Retardex*	lb.	.49 -	.49
Wiltrol P	lb.	.37 -	.39

RUBBER SUBSTITUTES

Mineral Rubber

Byerlyte*	ton	50.00 -	57.00
Hard Hydrocarbon (dms.)*	ton	53.00 -	55.00
Herron Flake*	ton	—— -	45.00
Mineral Rubber, Solid	ton	42.50 -	44.50
M. R. No. 38*	ton	55.00 -	65.00
Witresin	ton	—— -	52.50

Vulcanized Vegetable Oils

Amberex*	lb.	.29 -	.36
Brown	lb.	.15 -	.24
Car-Bel-Lite*	lb.	.3000 -	.3300
Neophax*	lb.	.17 -	.27
Polyrez A and C*	lb.	.12 -	.17
White	lb.	.15 -	.26

Miscellaneous Rubber Substitutes

G.B. Asphaltenes*	lb.	.06 -	.06½
Gilsowax B*	lb.	.09 -	.11
Resin No. 1098 (dms.)	lb.	—— -	.62
No. 1198*	lb.	.46¾ -	.49¾
Tysonite*	lb.	.26 -	.26¾

SOLVENTS

Acetone (dlvd.)	lb.	.11 -	.12
Amsco Lactol Spirits* (t.c.)	gal.	—— -	.19
Naphthol Spirits*	gal.	—— -	.18
Mineral Spirits*	gal.	—— -	.17
Rubber Solvent* (t.c.)	gal.	—— -	.18
Solv A* (t.c.)	gal.	—— -	.24½
Solv A-80* (t.c.)	gal.	—— -	.30
Solv B* (t.c.)	gal.	—— -	.28½
Solv B-90* (t.c.)	gal.	—— -	.32
Solv D* (t.c.)	gal.	—— -	.30
Solv E*	gal.	—— -	.30
Solv F*	gal.	—— -	.30
Solv F-80*	gal.	—— -	.32½
Solv G*	gal.	—— -	.42½
Special Naphtholite* (t.c.)	gal.	—— -	.18
Special Textile Spirits*	gal.	—— -	.19
Super Hi-Flash Naphtha*	gal.	—— -	.35
Super Naphtholite*	gal.	—— -	.18
Textile Spirits* (t.c.)	gal.	—— -	.19
Amyl Chlorides, Mixed (l.c.l.) (dms.)	lb.	—— -	.11
Benzol 90%	gal.	.36 -	.40
Butyl Acetate (t.c.)	lb.	—— -	.13½
Butyl Alcohol (t.c.)	lb.	—— -	.13½
Secondary (dlvd.)	lb.	.15 -	.16
Tertiary (dlvd.)	lb.	.15 -	.16
Carbon Bisulfide, Tech.	lb.	.0545 -	.0161
Carbon Tetrachloride	lb.	.10 -	.13½
Cosol 1*	gal.	.37 -	.43
2*	gal.	.42 -	.48
Cyclohexane	gal.	.55 -	.72
85% (c.l.) (dms.)	gal.	—— -	.56
Cyclohexanone	lb.	.29 -	.31½
Diacetone, Pure (dlvd.)	lb.	.15½ -	.16½
Dichlorethyl Ether (dms.)	lb.	.14½ -	.15
Formal (dms.)	lb.	.30¾ -	.31¼
Dichloropentanes (l.c.l.) (dms.)	lb.	—— -	.06
Dicom*	gal.	—— -	.50
Halowax Oil*	lb.	.28 -	.41
Heptanes* (t.c.)	gal.	.19 -	.22
Hexanes (t.c.)	gal.	.19 -	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.57 -	.64
Ether, Ref. (dlvd.)	lb.	.09½ -	.10½
Mersol*	gal.	.43 -	.79
Mesityl Oxide (dlvd.)	lb.	.15 -	.16
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.57 -	.63
Methyl Chloride	lb.	—— -	.11½
Methyl Ethyl Ketone	lb.	.15 -	.16
Methyl Isobutyl Ketone (dlvd.)	lb.	.17 -	.18
Methylene Chloride	lb.	.11¾ -	.16
N-5 Pentane Mix* (t.c.)	gal.	—— -	.13½
N-6 Hexanes* (t.c.)	gal.	—— -	.14½
N-7 Hexanes* (t.c.)	gal.	—— -	.13½
Penetrell*	gal.	.42 -	.63
Perchlorethylene	lb.	.11½ -	.14½
Petrolene* (t.c.)	gal.	—— -	.14125
Picolines, Alpha, Refined	lb.	.43½ -	.44
Mixed	lb.	.32½ -	.33
Proprietary Solvent (dms.)	gal.	.66 -	.77
Propyl Acetate (t.c., dlvd.)	lb.	—— -	.11¾
Alcohol (t.c., dlvd.)	lb.	—— -	.11
PT 150 Pine Solvent* (dms.)	gal.	—— -	.44
Pyridine, Refined	lb.	.74½ -	.75
Quinoline	lb.	.50 -	.54¼
Rubber Solvent (t.c.)	gal.	—— -	.16
Rubsol (t.c.)	gal.	—— -	.12875
Skellysolve B (Hexanes)* (t.c.)	gal.	—— -	.158
C (Heptanes)* (t.c.)	gal.	—— -	.151
R (Rubber Solvent)*	gal.	—— -	1.29
Solvent, Crude, Light	gal.	.19 -	.28
Solvesso 100* (t.c.)	gal.	.33 -	.35
150 (t.c.)	gal.	.33 -	——
Sunny South DD Dipentine*	gal.	.42 -	.63
Sunny South DD Pine Oil*	lb.	—— -	.15

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L64*	lb.	.33½ -	.39
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296-N*	lb.	.15 -	.16
530*	lb.	.15 -	.16
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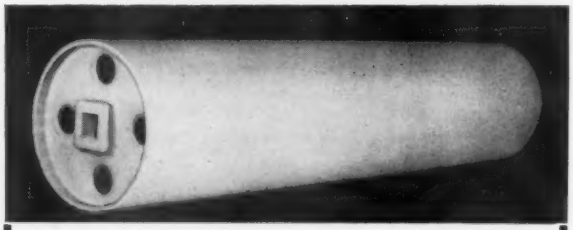

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JANUARY, 1958

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